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THESIS

THE IMPACT OF PAY ON NAVY PHYSICIAN RETENTION IN A HEALTH CARE REFORM ENVIRONMENT

by

Michael N. Lane
and
Brendan T. Melody

March, 1998

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Physicians are the most difficult health care professional group to retain on active duty beyond their first obligated tour. A major problem is the disparity between military and civilian physician income. In fiscal year 1997, the Department of the Navy spent approximately $135 million in specialty pay on the Navy's 4,000 active duty physicians. Health care reform has altered the demand for specialty and primary care physicians, accelerating the movement toward managed care. In this thesis, the authors quantify the role of the pay differential using a multivariate logistic model and conclude that the civilian-military pay differential has a significant influence on the probability that a physician remains in the Navy. Physician personnel and earnings data were gathered from the Defense Manpower Data Center, the American Association of Medical Colleges, and the Hay Group. Results indicate that recent shifts in demand have resulted in a greater sensitivity of retention to pay for primary care physicians. Specialty specific elasticities can be applied to analyze the expected impact of pay on retention of representative pay plans. Increases in pay to the civilian median level would substantially increase retention, but would be costly. This changing military environment in union with health care reform may be cause for the Navy to re-evaluate its physician pay structure and examine options for the amount, attached obligation, and recipients of medical special pays.

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THE IMPACT OF PAY ON NAVY PHYSICIAN RETENTION IN A HEALTH CARE REFORM ENVIRONMENT

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ABSTRACT

Physicians are the most difficult health care professional group to retain on active duty beyond their first obligated tour. A major problem is the disparity between military and civilian physician income. In fiscal year 1997, the Department of the Navy spent approximately $135 million in specialty pay on the Navy's 4,000 active duty physicians. Health care reform has altered the demand for specialty and primary care physicians, accelerating the movement toward managed care. In this thesis, the authors quantify the role of the pay differential using a multivariate logistic model and conclude that the civilian-military pay differential has a significant influence on the probability that a physician remains in the Navy. Physician personnel and earnings data were gathered from the Defense Manpower Data Center, the American Association of Medical Colleges, and the Hay Group. Results indicate that recent shifts in demand have resulted in a greater sensitivity of retention to pay for primary care physicians. Specialty specific elasticities can be applied to analyze the expected impact of pay on retention of representative pay plans. Increases in pay to the civilian median level would substantially increase retention, but would be costly. This changing military environment in union with health care reform may be cause for the Navy to re-evaluate its physician pay structure and examine options for the amount, attached obligation, and recipients of medical special pays.

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LIST OF ACRONYMS

AAMC:	Association of American Medical Colleges
AFHPSP:	Non-Deferred Armed Forces Health Professional Scholarship Program
AHA:	American Hospital Association
ASP:	Additional Special Pay
BAH:	Basic Allowance for Housing
BAS:	Basic Allowance for Subsistence
BAQ:	Basic Allowance of Quarters
BCP:	Board Certified Pay
BUMED:	Bureau of Medicine and Surgery
BUMIS:	Bureau of Medicine Information System
CBO:	Congressional Budget Office
CINC:	Commander in Chief
CNA	Center of Naval Analyses
COGME:	Council on Graduate Medical Education
CONUS:	Continential United States
DDO:	Day-to-Day Operation
DoD:	Department of Defense
DMDC	Defense Manpower Data Center
EEO:	Equal Employment Opportunity
FSA:	Family Separation Allowance
FMF:	Fleet Marine Force
FS:	Force Structure
GAO:	General Accounting Office
GME:	General Medical Education
GMO:	General Medical Officer
HD:	Hazardous Duty
HHS:	Health and Human Services

HMO:	Health Maintenance Organization
HMPDS:	Health Manpower Personnel Data System
HPPED:	Health Professional Pay Entry Date
ICONUS:	Isolated CONUS
ISP:	Incentive Special Pay
JUMPS:	Joint Uniform Military Pay System
LOS:	Length of Service
MHSS:	Medical Health Service System
MORB:	Medical Officer Retention Bonus
MSP:	Medical Special Pay
NDHPSP:	Non-Deferred Health Professional Scholarship Program
NRMP:	National Residency Match Programs
OCONUS:	Outside the continential United States
OSC:	Obligation Service Code
OSD:	Obligation Service Date
POM:	Program Objective Memorandum
POS:	Point of Service
PPO:	Preferred Provider Organization
RAP:	Radiology, Anesthesiology, and Pathology
RBRVS:	Resource Based Relative Value Scale
RMC:	Regular Military Compensation
SMS:	Socioeconomic Monitoring System
TAD	Tax Advantage
TW:	Theater Workload
THCSRR	Total Health Care Support Readiness Requirement
USUHS:	Uniformed Services University of the Health Sciences
VHA:	Variable Housing Allowance
VSP:	Variable Special Pay
YOS:	Years of Service

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We were extremely fortunate to have superb computer support available to us from Helen Davis and Dennis Mar. Without having such quick access to these two value assets, we may not have been able to conduct several in depth statistical analyses using SAS.

I. INTRODUCTION

A. BACKGROUND

More than 4,000 physicians serve on active duty in the medical corps of the Navy.[1] Their primary focus is to be prepared to care for casualties in a major war. In addition to this obligation, they provide an essential health care benefit to the Department of Defense's large population of beneficiaries. To guard against any shortages of these professionals, in 1990 congress authorized major increases in pay to all military physicians.[2] But since this pay authorization was passed in 1990, the health care industry has undergone reform. In 1992, the health care reform proposal stimulated by President Clinton heightened public awareness and accelerated the movement toward managed care. The Department of Defense (DoD) Health Affairs responded by using the Hay Group Physician Compensation Survey in determining a portion of medical specialty pay for military physicians. Congress should consider future changes in military medical pay as a result of changes in the size of the armed forces, the Total Health Care Service Readiness Requirement (THCSRR) system, and in the civilian health care industry.

In fiscal year 1997, the Department of the Navy spent approximately $130 million in specialty pay to the Navy's 4,000 active duty physicians. We are concerned whether this

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[1] "Med-52 (Special Pays) at the Bureau of Medicine and Surgery," Phone interview by LT Michael Lane MSC USN (November 1997).

[2] United States Congressional Budget Office, *Options for Paying Military Physicians,* (Washington: GPO, 1990).

system of specialty pays is adequate to meet the Navy's demand for physicians. The Congressional intent in initially creating medical special pays was described in these terms:

> . . . Historically, the most difficult officer group to retain on active duty beyond their first obligated tour is that of the health care professionals and within that group physicians are, by far, the most difficult subgroup to retain on active duty. A major cause of the difficulty is the disparity between the income of the health care professional and his civilian counterpart. It is only in the physician subgroup that major pay disparities currently exist . . .[3]

Associated testimony of the Deputy Assistant Secretary of Defense for Health Resources and Programs before the Senate Armed Forces Committee, included:

> One of the reasons we are asking for a bonus plan rather than an increase in basic compensation, is to permit us to tailor the amounts that we would pay individuals based upon changing circumstances. It would hardly seem consistent with that goal to permit people to enter into long-term contracts which might result in our paying larger bonuses than was necessary.[4]

The retention of military physicians has been a topic of much concern over the last two decades. Previous retention problems have been believed to be the result of a significant military/civilian pay gap in certain medical specialties. In particular, the managed care environment has been shifting demand toward the primary care physician.[5] Consequently the income growth of civilian specialists has been slowing while the income growth of the primary care physician (general/family practitioner, pediatrician, internal medicine) has been growing. The Navy has not changed the medical special pay structure since 1980, with the exception of increasing targeted pay for certain specialists and implementing a multi-year

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[3] Department of Defense, Office of the Secretary of Defense, *Military Compensation Background Papers.* (Washington: GPO, 1987).

[4] Ibid.

[5] Ibid.

retention bonus in 1990. However, significant changes in the civilian physician labor market have occurred since 1990. A reevaluation of the current pay structure, especially the targeted pay, is warranted since the relationship between pay and retention behavior for Navy specialist and primary care physicians is changing.

The shift in demand away from certain civilian physician specialties and toward primary care physicians should decrease the earnings of specialists and increase the earnings of primary care physicians. This creates a surplus of civilian specialists and therefore easier to buy off this market or lead to higher Navy specialist retention. Changes in civilian physician earnings by specialty over time, due to the growth of managed care, are analyzed in this thesis. To the extent that compensation for Navy physicians does not reflect the changes in the relative earnings of civilian physicians, the Navy may experience a retention rate too high in some specialties and too low in others, especially primary care physicians. The thesis will collect data and estimate a multivariate model of Navy Physician retention. The pay elasticities obtained from the multivariate retention model will provide insight on how the new military-civilian pay differentials, hypothesized to be impacted by managed care, affect retention of Navy physician specialists.

B. PURPOSE

In reviewing personnel requirements and authorizations in 1992 and 1996, there is a gap between inventory and authorization for certain specialties. This study observes whether the civilian/military pay differential has influenced the shortages found in certain specialties. This thesis replicates a previous study conducted by Dr. Joyce McMahon at the Center for Naval Analyses in 1989. Her study concluded that the civilian/military pay

differential has a significant influence on the probability that a physician leaves the Navy. She also indicated that increasing physician pay could be an effective policy tool to increase retention. We felt the need to update this study as it pertains to the rapid changing health care industry of today.

This study examines the observation that managed care has decreased the demand for some civilian physician specialties and increased the demand for primary care physicians. This shift in demand has resulted in a decrease in the earnings growth of some specialists and an increase in the earnings growth of primary care physicians. Trends over time in civilian physician earnings by specialty, since the influence of managed care, are analyzed. To the extent that current compensation patterns for Navy physicians have not kept pace with the changes in the earnings of civilian physicians, the Navy may experience a retention rate too high in some specialties and too low in others, specifically primary care physicians. Retention patterns from 1992 through 1996 are analyzed for Navy physician specialties to determine whether they have been affected by the managed care induced demand shift. We will determine this by quantifying the role of the civilian/military pay differential on retention. Managed care penetration is absorbed into civilian compensation, thus affecting civilian earnings. Differences across specialty categories are expected. Navy physician retention behavior by specialty will be estimated with a multivariate retention model to evaluate the sensitivity of retention to changes in the relative size of the pay differential, given that other influences have been controlled for in the model. The resultant pay elasticities can provide insight on how the new pay differentials, observed to be impacted by managed care, affect retention of Navy physician specialists.

C. RESEARCH QUESTIONS

There are several questions that this review attempts to answer with regard to the impact of pay on Navy physician retention in a managed care environment. Has the Navy's physician pay structure followed changes in private sector pay; especially those induced by the movement toward managed care? How has the growth in managed care changed the relative demand for civilian physician specialties and resulting pay levels? Has the demand for primary care physicians increased and what is the effect? What is the opportunity cost of Navy and civilian physician compensation? How does the changing pattern of demand for civilian physician specialists affect retention patterns of Navy specialists? Does the growth of managed care have an effect on retention of Navy medical specialists? Does this effect vary by specialty in a way consistent with the changes in the civilian labor market?

D. SCOPE AND METHODOLOGY

The thesis conducts a thorough literature review of physician retention models, medical specialty pay plans, and physicians' pay distributions compared to civilian income. It reviews changes in physician demand in the civilian market, human capital theory models, and the managed care index. It also reviews two studies concerning physician retention in the military, and one study examining the impact of managed care on employment and compensation of primary care and specialist civilian physicians. The data file used for the statistical analysis consists of pooled cross-sectional data from of the Health Manpower Personnel Data System (HMPDS) for 1992-1996. The data were provided by Defense Manpower Data Center (DMDC). The file contains information encompassing five major areas: medical primary and subspecialties; education data, including intern and residency

status; pay information detailing various medical specialty pays; information about current assignments; personal characteristics and other demographic data. The data set is screened for selected specialties that are unobligated at the initial and subsequent decision points after completing their initial obligation. The study determines the physician specialty groupings based on sample size of each medical specialty from the data and based on variation in the impact of managed care on different specialties.

A preliminary analysis of the data file involves calculating annual retention rates by specialty category across time and at different points in time for 1992-1996. Retention rates among Navy physicians for 1984-1987 are taken from a previous study based on a proposed specialty grouping. Retention rates among the specialty categories over time (1992-1996) will be compared with retention rates for 1984-1987 to see if retention has varied by specialty during health care reform.

The thesis examines retention rates among proposed physician specialty categories' by including an index of managed care in the retention equations. Retention rates are compared before and after health care reform began to influence civilian physician earnings. The pay elasticities are estimated for each specialty category using logistic regression. These estimates are then compared to those in prior studies, where health care reform was *not* an important factor.

This thesis calculates the military/civilian pay ratio ("spot" value), which is the variable of primary interest. Other control variables are included in the model to isolate the true independent effect of the pay variable.

From this analysis, the study determines if the narrowing income differentials between specialists and primary care physicians may require the Navy to reevaluate its pay structure and examine options for the amount, attached obligation, and recipients of specialty pays.

E. ORGANIZATION OF STUDY

Chapter II provides an overview of the managed care environment. It indicates that the health care reform initiative following President Clinton's efforts in 1992 is dramatically changing the demand for physicians. This chapter examines the managed care penetration effect associated with significant changes in physician compensation. The chapter discusses the overspecialized physician force and how managed care growth will magnify physician workforce concerns.[6] Specifically, we face an impending oversupply of civilian physician specialists, and there is a modest need for more generalists. Chapter II introduces the concept of the managed care penetration index in relation to civilian physician compensation. The chapter briefly examines evidence from National Residency Match programs that this growth has opened new positions in primary care, while reducing the number of positions in selected specialties.

This chapter also discusses Medical Corps current and future requirements in the context of Department of Defense (DoD) right sizing and managed care trends. The chapter will focus on special pay programs in an attempt to clarify the alphabet soup of the Medical Special Pay System. Finally, a review of prior studies is conducted to provide additional

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[6] Gregory G. Ruhnke, "Physician Supply and the Shifting Paradigm of Medical Student Choice." *JAMA* 277.1 (1997): 70.

information regarding the effects of the current and future managed environment on physician supply and demand.

Chapter III describes the conceptual framework for the specification of the multivariate model of retention. It provides a description of the following three data sources: the HMPDS file from DMDC, American Association Medical Colleges (AAMC) physician compensation survey, and the Hay Group physician compensation survey. Dependent variable specification is given using the physician's behavior in a given category as the dependent variable. The chapter also lists the explanatory variables for the model and their expected effect on the physician retention decision.

Chapter IV delineates the data analysis using the statistical model to determine the probability that a physician would remain in the Navy, given the explanatory variables. This chapter examines the authorization and inventory requirements of physicians by specialty, while examining the "goodness of fit" of the model, elasticity, and marginal effects.

Chapter V provides a summary of research results, recommendations, and areas of future study. It discusses whether the changing military environment, in conjunction with the narrowing income differentials between specialists and primary care physicians, may require the Navy to reevaluate its pay structure.

II. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

A. OVERVIEW OF THE HEALTH CARE REFORM ENVIRONMENT

This section will provide a literature review and theoretical discussion in four areas: health care reform initiatives; the shift from specialty to primary care; current and future medical requirements; and prior studies regarding Navy physician retention.

In 1992, the Clinton administration's health care reform proposal heightened public awareness of the movement toward managed care. The prime motivator for reform has been the rapidly accelerating health care costs, which exceeded one trillion dollars in 1994.[1] The Clinton proposal made a creditable start at solving many of the issues that hospitals and the American Hospital Association (AHA) have sought to address, chiefly health care coverage and delivery system restructuring.[2] Although Clinton's plan provided substantial common ground, it also created some battlefields where improvement was needed. Following the proposals and debate, hospitals had two main objectives: to make sure the debate stayed on track and that health care reform happened.[3] In spite of a lack of consensus on reform among Members of Congress and

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[1] RADM William Rowley, MC, USN, "Health Care Delivery in the 21st Century Trends and Predictions," (1995), 12.

[2] American Hospital Association, "Initial Summary and Analysis of President Clinton's Health Care Reform Proposal," (September, 1993), 1.

[3] Ibid., 4.

the major health care special interest groups, health care reform is proceeding rapidly in the marketplace.[4]

Managed care was seen as the only politically acceptable way to control costs and simultaneously improve quality. Managed competition was the underlying approach to the Clinton health care reform proposal. This approach believed that the best way to deliver health care is through organized networks that functioned as direct care systems and insurers of care. The managed competition strategists called for a market that enabled the consumer to choose between competing systems of care based on the price and objectively measured quality of care under each system.[5]

Managed care is defined as any system of delivering health services via a specialized network of parties who agree to comply with approaches established by a care-management process.[6] Managed care often involves a defined delivery system of providers with some form of contractual arrangement with a plan. This would include a Health Maintenance Organizations (HMO), Point of Service (POS), and Preferred Provider Organizations (PPO).

Health Maintenance Organizations (HMO)

HMOs offer prepaid, comprehensive health coverage for both hospital and physician services. An HMO contracts with health care providers, e.g., physicians,

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[4] Rowley, 12.

[5] George C. Halvorson, *Strong Medicine* (New York: Random House, 1993), 181.

[6] Halvorson, 237.

hospitals, and other health professionals and members are required to use participating providers for all health services. Members are enrolled for a specified period of time.

Point of Service (POS)

POS is also known as an open-ended HMO. POS plans encourage, but do not require, members to choose a primary care physician. As in traditional HMOs, the primary care physician acts as a "gatekeeper" when making referrals; plan members may, however, opt to visit non-network providers at their discretion. Subscribers choosing not to use the primary care physician must pay higher deductibles and copays than those using network physicians.

Preferred Provider Organizations (PPO)

PPO is a financing arrangement in which a network of providers agree to furnish services and be paid on a negotiated fee schedule. Enrollees are offered a financial incentive to use doctors on the preferred list. The services may be furnished at discounted rates and the insured population may incur out-of-pocket expenses for covered services received outside the PPO if the outside charge exceeds the PPO payment rate.

Managed care and integrated delivery systems are providing a growing share of health care services and this growth has dominated recent changes in the medical marketplace. As of 1995, more than 120 million Americans were enrolled in health maintenance organizations (HMO's) or preferred provider organizations (PPO's), an

increase of from 10 million in 1982. More than 83 percent of patient care physicians had a managed care contract.[7]

Evidence suggests that managed care is changing the relative emphasis on specialty and primary care. A 1994 survey of 24,500 physicians, conducted by the Hay Group and sponsored by Harvard Community Health Plan and CIGNA Corp., showed that managed care initiatives have led to a slowing in the growth of physicians' pay and a shift in the emphasis from specialties to primary care.[8] The sixth annual Hay Physicians' Total Compensation Survey showed that the growth in physician compensation levels slowed between 1992 and 1994 across all specialties, and that the compensation for primary care physicians would be expected to grow at a higher rate than those of specialists.[9]

1. Primary Care Emphasis/Managed Care Penetration

Legislation instituted in 1992 by the Health Care Financing Administration placed an increased emphasis on primary care physicians. Primary care focuses on health and prevention rather than illness and cure. Care is continuous and integrated rather than episodic and comprehensive, which deals only with specific problems. There emphasis is

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[7] Carol J. Simon, David Dranove, and William D. White, "The Impact of Managed Care on the Physician Marketplace." *Public Health Reports* 112 (1997): 223.

[8] Morley M. Robbins and Richard C. Loudermilk, "Lining Up Their Shots." *Hospitals & Health Networks* (May 1994): 30.

[9] Ibid.

on patient education. Practitioners practice in teams in a manner which creates process efficiency.

From a reimbursement standpoint, "fee-for-service" is decreasing as a percentage of physicians' total revenue.[10] Managed care organizations employ fewer physicians per patient than "fee-for-service" practices, employ more generalists, and selectively contract with specialists.[11] Additionally, generalists save money because they tend to order fewer tests and utilize less expensive treatment modalities for common illness. Managed care plans have sought to directly control the use of specialists through utilization review and reliance on the primary care physician market as "gatekeepers." This gatekeeper role is increasing the opportunity for primary care physicians to manage patients efficiently across the continuum of care.[12] Consequently, the labor market for family practitioners, pediatricians and internists has become highly competitive. Economic theory suggests that changes in the relative demand for physician services will affect compensation and specialty choices. Adjustments may occur most rapidly in compensation. In the short run, an increase in the use of primary care services may give rise to a scarcity of primary care physicians and cause earnings to rise. Existing primary care physicians would be delivering more services and competing managed care plans would tend to bid up physicians' fees and compensation. Similarly, a decline in the use of specialty care

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[10] Robbins, 32.

[11] Gregory G. Ruhnke, "Physician Supply and the Shifting Paradigm of Medical Student Choice." *JAMA* 277.1 (1997): 70.

[12] Robbins, 33.

would generate a surplus of specialists. Compensation levels would decrease as patient volumes fall.[13] This shift towards managed and capitated[14] systems of care that use fewer specialists coincides with an abrupt decline in the number of specialist positions advertised and in the ratio of specialist to generalist positions.[15]

Previous studies have examined how *managed care penetration* affects the employment and compensation of primary care and specialty physicians. Managed care penetration can be defined and measured in a number of ways. It is defined and measured as the proportion of the total lives (population), at a particular time and location, that is insured under a managed care arrangement or the proportion of those insured who are insured through managed care.[16] This type of measurement can be difficult because patient enrollment numbers are available only for HMOs, which constitute only part of the managed care marketplace. The Simon, Dandrove, and White study using the Socioeconomic Monitoring System (SMS) and measures managed care penetration based on the average percentage of physician revenue derived from a managed care contract.

The thesis assumes that the managed care penetration index can be used to monitor the measurement of opportunity cost (pay differential) between military and

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[13] Simon, "The Impact of Managed Care," 223.

[14] A *Capitated* system of care refers to a health insurance mechanism in which health care providers are paid a fixed amount of money each month per insured person to cover services over a period of time, usually a year.

[15] "Marketplace demand down for Specialists, Up for Family Physicians." *Science News Update* 1996 [JAMA Online]; Available: Http:/www.ama-assn.org/sci-pubs/sci-news/1996/.html; Internet; accessed 5 October 1997.

[16] Paul Hogan of Lewin Group.

civilian physician compensation. One recent survey concluded that the average growth of managed care in 15 of America's cities was 21 percent from 1994 to 1995 (Figure 1).[17] From a regional viewpoint, managed care penetration (especially HMOs) is rising everywhere (Table 1).[18] Table 1 illustrates that between 1992 and 1995 HMO enrollment, including POS plans, in the Northeast increased from 24 percent of insured workers to 49 percent. By market size, while the highest percentages of managed care reside in communities of over 1 million, the fastest growth of managed care (21 percent) is in midsize communities of 250,000 to 1 million.[19]

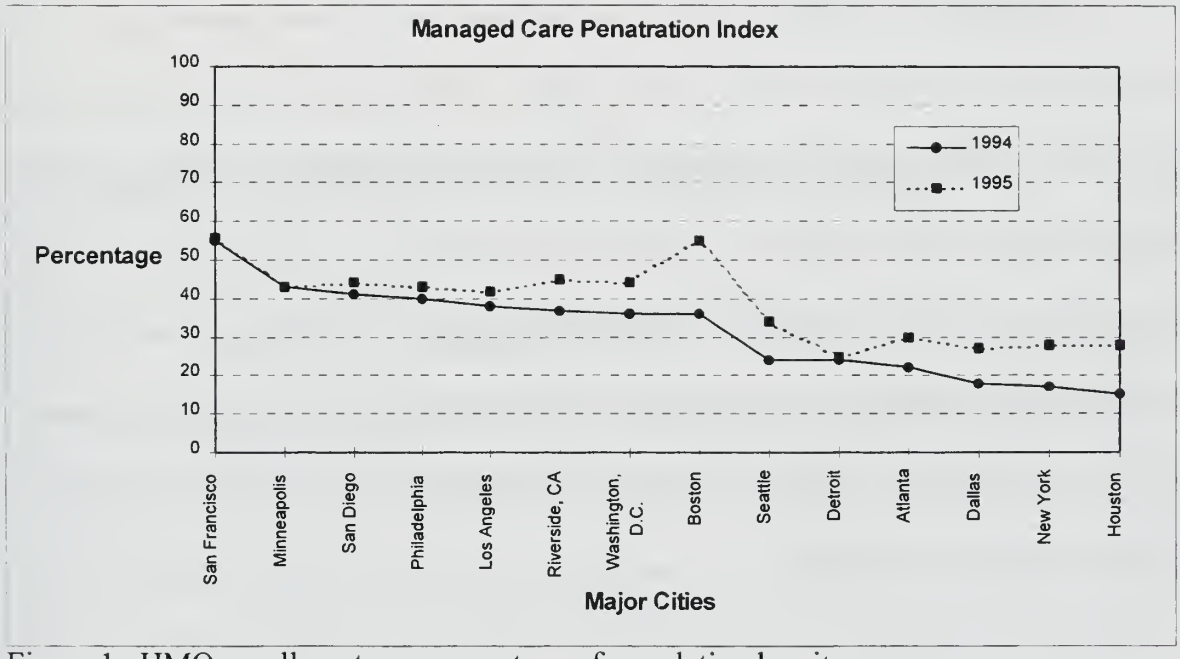

Figure 1. HMO enrollment as a percentage of population by city
Source: Managed Care magazine: (1996): On-line.

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[17] "Houston Leads Major Cities in HMO Penetration Growth." *Managed Care magazine* 1996. [Online]; Available: Http:/www.managedcaremag.com; accessed 12 Nov 1997.

[18] Walter A. Zelman, *The Changing Health Care Marketplace.* (Jossey -Bass Publishers, San Francisco, 1996), 18.

[19] Ibid.

Table 1. Percent enrolled in HMOs by region, 1992-1995 (Includes POS plans)

	1992 (percent)	1995 (percent)	Growth (percent)
National	25	41	64
Northeast	24	49	104
South	20	32	60
Midwest	21	35	66
West	36	54	50

Source: Walter A. Zelman, *The Changing Health Care Marketplace.*, (San Francisco: Jossey-Bass Publishers, 1996), 18.
Note: Employer-provided insurance only

InterStudy Publications analyzed the managed care market penetration in 301 metropolitan areas (defined by the census bureau). Their analysis describes how sixty-nine cities claim managed care penetration, in its strict definition, of greater than 25 percent; while smaller health care markets show penetration of 16 percent.[20] Using penetration data from InterStudy Publications, Figure 2 provides a state-by-state comparison of managed care penetration for 1996. Managed care penetration is discussed in more detail in Simon, Dranove, and White's study found in the "Review of Previous Studies" section of this chapter.

[20] "Two out of Three HMO Members Live in Large Metropolitan Area" *Managed Care Magazine* [Online] Available: Http:/www.managedcaremag.com; accessed 12 Nov 1997.

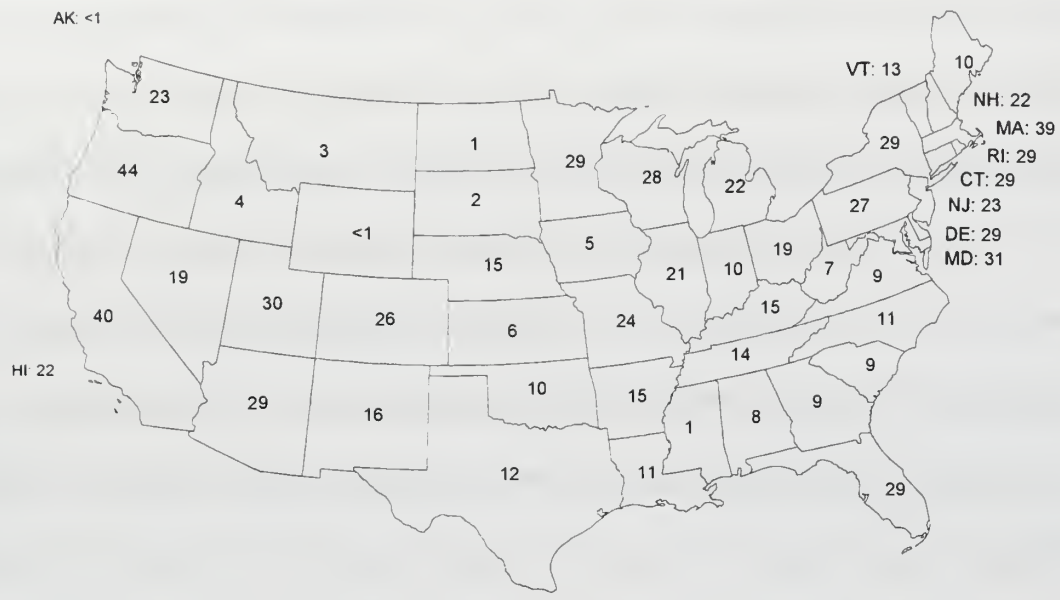

Figure 2. HMO enrollment as a percentage of total state population in 1996
Source: Managed Care magazine: *Managed Care Outlook* (December 1996): On-line.

2. Physician Compensation Growth

The disproportionate fees paid to specialists are a problem in all areas of U.S. health care. Historically, this gave specialty providers an incentive, because of higher reimbursement, to provide unnecessary procedures and encouraged a disproportionate number of medical students to enter into nonprimary-care specialties.[21] The federal government identified the excessive variance in income, among specialist physicians, and revised the payment approach. In 1992, the Health Care Financing Administration instituted a modified pay schedule process for Medicare called the resource based relative

[21] Halvorson, 38.

value scale (RBRVS).[22] The goal of this new process was to reduce specialty incomes and to increase primary-care incomes. This new payment process coupled with a shortage of primary care doctors and a surplus of expensive specialists has closed the compensation gap between generalists and specialists. The following table shows the significant growth in compensation for primary care physicians during the period 1992 through 1994. It also highlights the slow growth of compensation for "procedure-based specialties."[23] Annual compensation for the procedure-based specialties grew around one percent whereas compensation for primary care specialties grew between 14 and 26 percent.

Table 2. Compensation Trends Across Specialties

PATIENT FOCUS		TOTAL ANNUAL COMPENSATION			% CHANGE
		1992	1993	1994	1992-1994
PRIMARY CARE SPECIALTIES	FAMILY PRACTICE	$108,000	$116,900	$123,700	14.33%
	PEDIATRICS	$112,900	$126,700	$132,900	17.71%
	INTERNAL MEDICINE	$108,400	$124,800	$137,400	26.75%
HOSPITAL-BASED SPECIALTIES	ANESTHESIOLOGY	$189,300	$203,900	$204,700	8.14%
	RADIOLOGY	$188,300	$200,900	$211,700	12.43%
	PATHOLOGY	$149,100	$162,100	$166,000	11.33%
PROCEDURE-BASED SPECIALTIES	GENERAL SURGERY	$185,000	$186,800	$187,100	1.14%
	ORTHOPEDICS	$235,800	$243,600	$237,000	0.51%
	CARDIO/NON-INVASIVE	$188,100	$197,300	$190,500	1.28%
OFFICE-BASED SPECIALTIES	RHEUMATOLOGY	$134,700	$138,500	$145,300	7.87%
	GASTROENTEROLOGY	$172,900	$179,300	$182,400	5.49%
	PULMONARY	$142,600	$151,700	$152,300	6.80%

Source: Morley M Robbins and Richard C . Loudermilk, "Lining Up Their Shots" *Hospitals & Health Networks* (May 1994), 32.
Note: The compensation figures provided represent averages for the specialists identified.

[22] Ibid.

[23] Robbins, 34.

The growth trend among the all specialists during the period of 1992 to 1994 is more complex than what the table describes. A more detailed examination of table 2 reveals clusters of trends among the four groups of specialists. The reduced rate of increase shown above for procedure based specialties and the high rate of growth in primary care specialties indicate that the health care market is redefining their value.

3. Overspecialized Physician Force

Several reports have examined the potential oversupply of Hospital and Procedure-Based physicians.[24] Currently about 34 percent of America's physicians are primary care generalists (family practitioners, internists, and pediatricians), whereas in Canada and other Western countries about 70 percent are generalists.[25] Most physician analysts agree that, despite a moderate need for primary care, we face an impending oversupply of physicians.[26] In 1995, there were 50 to 300 percent more physicians in most specialties than the number required to care for all Americans using the staffing standards of large HMOs.[27] The continued growth in managed care may magnify the physician surplus and the imbalance in the primary care-to-specialist identified in the

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[24] Ruhnke, 70.

[25] RADM William Rowley, MC, USN, "Health Care Delivery in the 21st Century Trends and Predictions," (1995), 2.

[26] Ibid.

[27] Rowley, 2.

1992 Council On Graduate Medical Education (COGME) third report.[28] In the sixth COGME report of 1995, the council predicted a surplus of 115,000 specialists by the year 2000. Overspecialization during the 1980s propelled health care costs, while intensifying the problem of a physician-induced demand.

A study by Simon, Dranove, and White (1997) on the impact of managed care on the physician workplace found that primary care incomes grew 4.78 percent annually in states with high managed care growth and 1.2 percent where there was slow growth. The incomes of radiologists, anesthesiologists, and pathologists only rose 0.14 percent in states with high managed care growth compared to 4.14 percent where growth was slow.[29] Data gathered from HMOs on the projected increase in managed care plans through the end of the decade lend credit to the expectation that managed care will increase and, with that increase, the relative demand for generalists will rise.

Additionally, according to a JAMA Report (1997) government policies funding graduate medical education (GME) without regard for the changing dynamics of physician employment has facilitated an overspecialized physician workforce. Heightening that dilemma is a possible "cobweb effect" where the medical students' choice of specialty has not reflected the market dynamics of generalist and specialist

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[28] The Council on Graduate Medical Education was authorized by congress in 1986 to provide an ongoing assessment of physician workforce trends and to recommend appropriate federal and private sector efforts to address identified needs. Legislation calls for COGME to serve in an advisory capacity to the Secretary of the Department of Health and Human Services (DHHS), Senate Committees on Labor and Human Resources, and the House of Representatives Committee on Commerce.

[29] Simon, "The Impact of Managed Care," 222.

demand, as would be expected in an efficiently functioning labor market, because medical students make decisions regarding specialty selection based on lagged earning rather than expected future earnings. Resident input was the primary mechanism by which physician employment information was communicated to medical students. However, recent data suggests medical students are now incorporating future market conditions into their choice of specialty and are responding to the shifting job opportunities for generalists relative to specialists.[30]

4. National Residency Match Programs

Evidence from the National Residency Match Programs (NRMP) indicates that since 1989, residency programs have opened new positions in primary care and that growing numbers of new physicians are choosing to fill them. At the same time programs are reducing the number of positions in selected specialist positions. Between 1989 and 1995 the number of family practice and pediatric residency positions increased by 10.8 percent, and the number filled rose by 32 percent. There was modest evidence of an increase in the attractiveness of surgical specialty training in that the proportion of residency positions filled remained relatively stable. The number of radiology, anesthesiology, and pathology (RAP) positions increased by 14 percent, peaking in 1993, but the number filled decreased by more than 15 percent. Virtually the entire decline was accounted for by positions in anesthesiology.[31] Figure 3 shows that the percentage of

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[30] Louis Goodman, "Managed Care's Role in Shaping Physician Job Market." *JAMA* 277.1 (1997): 72.

[31] Simon, "The Impact of Managed Care," 229.

medical school graduates planning a career in primary care dropped from 34.1 percent in 1983 to a low of 14.6 percent in 1992. But since then, the numbers have turned around in that the choice of general medicine rose to 27.6 percent in 1995.[32]

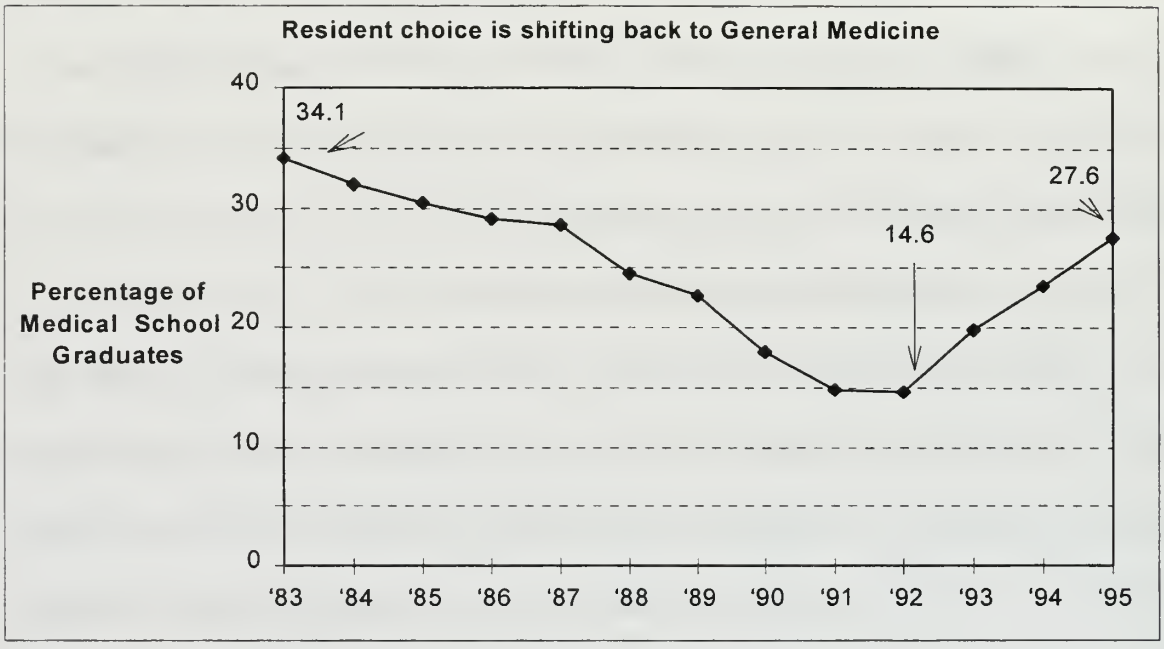

Figure 3. Percentage of medical school graduates interested in General Medicine
Source: "Facts, Applicants, Matriculants and Graduates 1988-1994" Association of American Medical Colleges.
Note: General medicine consists of family practice, general internal medicine and general pediatrics.

B. MILITARY PHYSICIAN WORKFORCE FOR THE TWENTY-FIRST CENTURY

Reductions in the size of the armed forces, coupled with a greater focus on satisfying peacetime medical needs could decrease the military's need for uniformed physicians. A Congressional Budget Office study in 1990 found that although there had

[32] New York Times. "Specialty or General Practice: Young Doctors Change Paths, " Oct 16 1995, B2.

been several years of declining retention, approximately 740 more physicians served on active duty in the medical work force in 1988 than in 1982, there was a 9 percent increase.[33] The 1990 Congressional Budget Office study on alternative plans for paying physicians considered the following illustration: a one-third reduction in the military to 1.4 million active-duty personnel.[34] This decline would reduce the total population that is served by the military by one-fifth, to 6.6 million.[35] Based on staffing patterns in large civilian health maintenance organizations, the military would need approximately 8,320 physicians to serve the health care needs of that reduced population size, and the specialty mix would need to shift away from surgery.[36] The military readiness platform for the medical department determines the roles and requirements for the wartime and peace time mission. As the reserves assume a larger role in maintaining medical readiness for war, the active components will need fewer physicians, not more. These changes provide additional reasons to look at the current pay structure in light of the changing civilian health care environment.

1. Total Health Care Support Readiness Requirement (THCSRR)

Since the end of the cold war, the U.S. Navy has undergone a multitude of changes, THCSRR was driven by the "733 study." Congress directed this two-year

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[33] CBO, " Options for Paying Military Physicians", 8.

[34] Ibid.

[35] Ibid., xiii.

[36] Ibid., xiii.

study in section 733 of the National Defense Authorization Act for Fiscal Years 1992 and 1993.[37] This is best put in the following quotation:

> As budgetary and legislative pressures have continued to 'right size' the Navy. Navy medicine responded by developing the Total Health Care Support Readiness Requirement (THCSRR) model. This model allows Navy medicine to accurately determine and project its active duty manpower readiness requirements to the subspecialty level based on the two readiness missions of Navy medicine: Wartime and Day-to-Day Operational support to the Fleet and Fleet Marine Force (FMF).[38]

a. Navy Medicine's Missions

The Department of Defense (DoD) maintains a medical establishment for three separate but united reasons. The most important reason is to meet wartime demands for medical care. The second reason is to preserve the medical readiness of military personnel in peacetime so they can mobilize in the event of a conflict or other requirements. The third reason is to provide the health care promised to approximately three million beneficiaries. In order to understand how Navy medicine defines its manpower readiness requirements, an understanding of its three missions is necessary: Wartime, Day-to-Day Operational Support, and the Peacetime Health Benefit.

(1) Wartime Mission: "To meet wartime demands for medical care in a scenario defined by two nearly simultaneous major regional conflicts

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[37] William J. Lynn, "Section 733 Study of the Military Medical Care System," Statement presented before the Subcommittee on Military Forces and Personnel Committee on Armed Services United States House of Representatives 103d Congress," Washington D.C., 19 April,1994.

[38] LT T.H. Weber , "The THCSRR Model: Determining Navy Medicines' Readiness Manpower Requirements" *Navy Medicine*, (September-October 1994): 19.

(MRCs)."[39] This mission encompasses the following: mobilizing two hospital ships, supporting the fleet, supporting the Fleet Marine Force, numerous fleet hospitals, and maintaining outside the continental United States (OCONUS) Medical Treatment Facilities (MTFs) and Dental Treatment Facilities (DTFs).

(2) Day-to-Day Operational (DDO) Support Mission: This mission is supported by two elements, the Peacetime Operational Force and the CONUS Rotational Base. The Peacetime Operational Force is defined as the Fleet, Fleet Marine Force, OCONUS MTFs/DTFs and isolated CONUS locations (ICONUS). This mission is also supported by a CONUS RB, which is the number of shore billets required to support the Peacetime Operational Force. One of the most influential factors in the DDO component is the Rotational Base for the Peacetime Operational Force. The Rotational Base is designed to provide a pool of skilled and trained active duty medical personnel to relieve those serving overseas, with the fleet and Fleet Marine Force, and in isolated CONUS duty stations. While awaiting assignment to Peacetime Operational Force billets, these personnel serve in CONUS hospitals and clinics providing health care services to active duty members and the beneficiary population.[40]

(3) Peacetime Health Benefit Mission: In 1997, the Navy provided health care to approximately 700,000 active duty Navy and Marine Corps members and 2.6 million active duty, retired and family member beneficiaries via the

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[39] Lynn, 3.

[40] K. Copenhaver, "Requirement Model and Programing Costs," (Masters thesis, Naval Postgraduate School, 1994), 74.

direct care system or CHAMPUS (currently TRICARE).[41] The first two missions, the Wartime and DDO missions, define the number of active duty Navy personnel. Only because of the requirement number of Navy personnel needed to support these first two missions, that this third mission of providing medical and dental care in CONUS MTFs and DTFs can be accomplished.

b. THCSRR Model Background

The driving force for the THCSRR model came from the economic and legislative pressures that were placed on the Department of Defense in 1991 to downsize the total force structure. Navy medicine began feeling these pressures when a study of the Medical Health Services System (MHSS) was conducted by the Office of the Secretary of Defense, Program Analysis and Evaluation. This two-part study, titled the "733 Study," "determined the total medical care requirements needed to support active duty services during a post cold-war time scenario."[42]

The two parts of the "733 study" were the Wartime and Peacetime requirements. The "733 study" determined the number of Navy medical personnel necessary to support Theater Workload (TW) and Force Structure (FS) requirements. These include fleet hospitals, hospital ships, echelon one and two care, OCONUS

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[41] The Bureau of Medicine and Surgery Homepage; Available: Http:/www.support1.med.navy.mil/bumed/; Internet; accessed January 1998.

[42] Lynn, 2-4.

Medical and Dental Treatment Facilities, Research and Development, trainers, and headquarters staff (e.g., BUMED, CINC).[43]

The study suggested that since the end of the cold war the number of active duty Navy personnel has decreased, and implied that medical manpower requirements need to decrease while maintaining the two MRC scenarios. The "733 study" conjectured that only half of the active-duty physicians projected to be available in fiscal year 1999 would be required to meet wartime demands. Although the study went on to assess the peacetime benefit, the Surgeon General of the Navy, Vice Admiral Hagen asked the Center for Naval Analyses (CNA) to conduct a study to examine the manpower requirements unique to Navy medicine to meet the day-to-day operational mission.[44]

Upon completion of the CNA study in 1992, VADM Hagen tasked his Program Objective Memorandum (POM) FY96 Medical Task Force to develop a single manpower readiness requirement model that incorporated both the "733 Study" and CNA studies. This model is now known as the Total Health Care Support Readiness Requirement or THCSRR. "THCSRR calculates the minimum active duty medical end strength required to meet both parts of the readiness mission, namely, wartime requirements and the day-to-day operational health care requirement . . .."[45]

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[43] Copenhaver, 43.

[44] Weber, 20.

[45] CDR J. A. Bashford, "A Navy Medical Department Overview for the DON QOL Master Plan" *Navy Medicine* (February 1996), 7.

c. Future of Navy Medicine under THCSRR

With THCSRR, Navy medicine has defined the most efficient and effective mix of manpower readiness requirements. However, implementation of these requirements will be a challenge in an environment of competing demands. THCSRR has established a stable floor for the minimum number of active duty in all medical communities. Due to the intense budget environment, there is a high probability that any community whose billet authorization exceeds its THCSRR requirement will be reduced to its THCSRR floor.[46] Navy medicine is moving toward total implementation of THCSRR within the next five years. Several studies are presently being conducted to determine the most cost efficient make-or-buy solution (i.e. outsourcing) to providing health care in the peacetime environment.[47] That is to say, if providing health care with active duty medical personnel is less expensive than purchasing the Navy's health care, than the number of active duty medical personnel will be maintained. If purchasing civilian health care is less expensive, than military medical personnel cuts will most likely be made. Any cuts will be those personnel in excess of THCSRR requirements.

DoD's requirement for physicians has been modified as a result of the end of the Cold War scenario, the advent of regional threats, and the pervasive downsizing of the military in response to budget deficits. Additionally, DoD had dramatically altered its approach to providing medical care to military beneficiaries during peacetime. DoD

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[46] Weber, 22.

[47] Captain (sel) Penny Turner MSC USN, "Medical Resources, Plans, and Policy Division (N931C2C) CNO," Email and phone interview by LT Michael Lane MSC USN, (September 1997).

started relying more extensively on civilian providers to deliver much of that care. Although the department is currently reevaluating its projected demand for physicians, it has not reached final decisions about the number of physicians needed nor the optimal length of time that physicians should serve.[48]

2. Future Civilian Physician Requirements

Following a brief discussion of the 1992 Council on Graduate Medical Education (COGME) third report and its implications, this section provides a forecast of civilian physician demand using an overview of two physician supply and demand projections. The first is the 1996 COGME eighth report titled *Patient Care Physician Supply and Requirements* and the other is from *Managed Care Magazine* on-line which uses data from the Sachs Group located in Evanston, Illinois.

In the rush to balance the proportion of primary care physicians and specialists, the 1992 COGME third report described the concept of the "110:50/50 recommendation" or "50% solution."[49] This recommended the following:

> . . . the number of physicians entering residency be reduced from 140% to 110% of the number of graduates of allopathic and osteopathic medical schools in the United States in 1993 and that the percentage of those graduates who complete training and enter practice as generalists should be increased from the current level of 30% to 50%.[50]

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[48] General Accounting Office , *Military Physicians: DOD's Medical School and Scholarship Program*, GAO/HEHS-95-244 (Washington D. C., September 1995).

[49] The COGME Third Report was titled: *Improving Access to Health Care through Physician Workforce Reform: Directions for the 21st Century.*

[50] COGME *Eighth Report*: *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, (Rockville, Maryland DHHS November 1996): 1.

The implications of these suggestions are enormous. This implies that first year residency positions in the United States would be reduced from 25,000 to approximately 19,600, a 22 percent decrease.[51] The number of physicians entering specialties would drop 44 percent, while the number of generalists would increase by one-third.[52] The president's "Health Security Act" calls for this goal to be achieved among resident physicians by the year 2003.[53]

In the first overview, the COGME eighth report utilizes five approaches to project future physician requirements using two different methodologies. One is an adjusted needs-based methodology, while the other four are demand-based. The demand-based methods make assumptions about patterns of health delivery and an individual's ability to pay for services. They then project future demand based on current utilization rates, projected increases in population size, and specific assumptions about the delivery system.[54] Table 3 shows the physician requirements in the year 2000 and the year 2020 for each of the five requirement methods as well as the projected supply of generalists and specialists.[55] The last line in the table calculates the projected surplus or shortage. Despite different assumptions in regard to physician requirement projections, all

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[51] Ibid.

[52] Ibid.

[53] R.A. Cooper, "Seeking Balanced Physician Workforce for the 21st Century." *JAMA* 272 (1997): 680.

[54] COGME *Eighth Report,* 8.

[55] Ibid., 11.

scenarios project 60-80 generalists per 100,000 population in the early 21st century (Figure 4).[56] As illustrated in figure 4, the projected supply lies in the lower portion of COGME's requirement band (shaded area in figure). COGME concludes that future specialist requirements in the early 21st century will be approximately 85-105 specialists per 100,000 population. Figure 5 illustrates that the projected supply of specialists, excluding residents, will be 40 percent above upper levels of the requirement band and 54 percent above the requirement band if residents were included.[57] Figures 6 and 7 provide a comparison of the specialty mix alternatives when the supply of total residents is reduced to 110 percent of the United States Medical Graduates.[58] This methodology suggests that both a reduction in trainees to at least 110 percent of United States Medical Graduates as well as an increase in proportion of generalists to 50 percent will best bring generalists and specialist population ratios toward the upper limits of their respective requirement ranges.[59]

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[56] Ibid., 8.

[57] COGME *Eighth Report,* 9.

[58] Ibid., 14.

[59] Ibid.

Table 3. Generalist and Specialist Patient Care Requirements and Forecasted Supply Under Current Trends: Physicians per 100,000 Population

	Year 2000			Year 2020		
Source	Generalist	Specialist	Total	Generalist	Specialist	Total
BHPr Managed Care Scenario[1]	77	96	173	81	92	173
Weiner[2]	59	82	141	-	-	-
GMENAC[3,4]	72	106	178	-	-	-
BHPr Fee-for-Service Scenario Utilization-based[5]	69	138	207	76	149	225
Cooper[6]	75	128	203	75	148	223
Requirements Range	59-77	82-138	141-207	75-81	92-149	173-225
Projected Supply	63	140	203	66	148	214
Surplus (+) / Shortage (-)	+4/-14	+58/+2	+62/-4	-9/-15	+41/-11	

1. Gamliel S. Polizer R, Rivo M, Mullan F. "Managed Care on the March: Will the Physician Workforce Meet the Challenge?" *Health affairs*, Summer 1995.

2. Weiner JP. "Forecasting the Effects of Health Care Reform on U.S. Physician Workforce Requirements: Evidence from HMO Staffing Patterns". *JAMA* 1994; 272 (3): 222-230.

3. Bowman, M.A, Et al. "Estimates of Physician Requirements for 1990 for the Specialties of Neurology, Anesthesiology, Nuclear Medicine, Pathology, Physical Medicine and Rehabilitation, and Radiology: A Further. Application of the GMENAC Methodology". *JAMA* 250; 1983.

4. "Summary Report of the Graduate Medical Education National Advisory Committee". September 1980, Vol 1, US DHHS pub no. (HRA) 81-651. Rockville, MD: Office of Graduate Medical Education, HRSA, April 1981.

5. "Refinements to BHPr Requirements Forecasting Models", Vol II: Data and Methology. Rockville, MD: BHPr, HRSA, April 1993.

6. Cooper R. "Seeking a Balanced Physician Workforce for the 21st Century. *JAMA* 1994; 272(9):680-687.

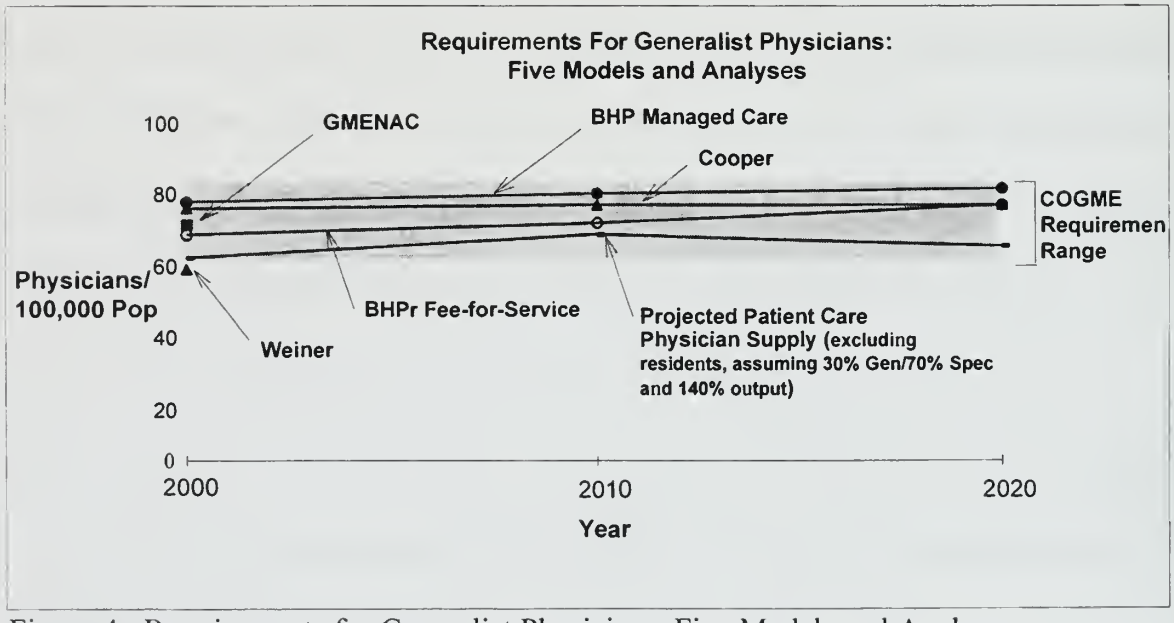

Figure 4. Requirements for Generalist Physicians: Five Models and Analyses
Source: Council on Graduate Medical Education. *Eighth Report*: *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, (Rockville, Maryland: DHHS, November 1996): 8.

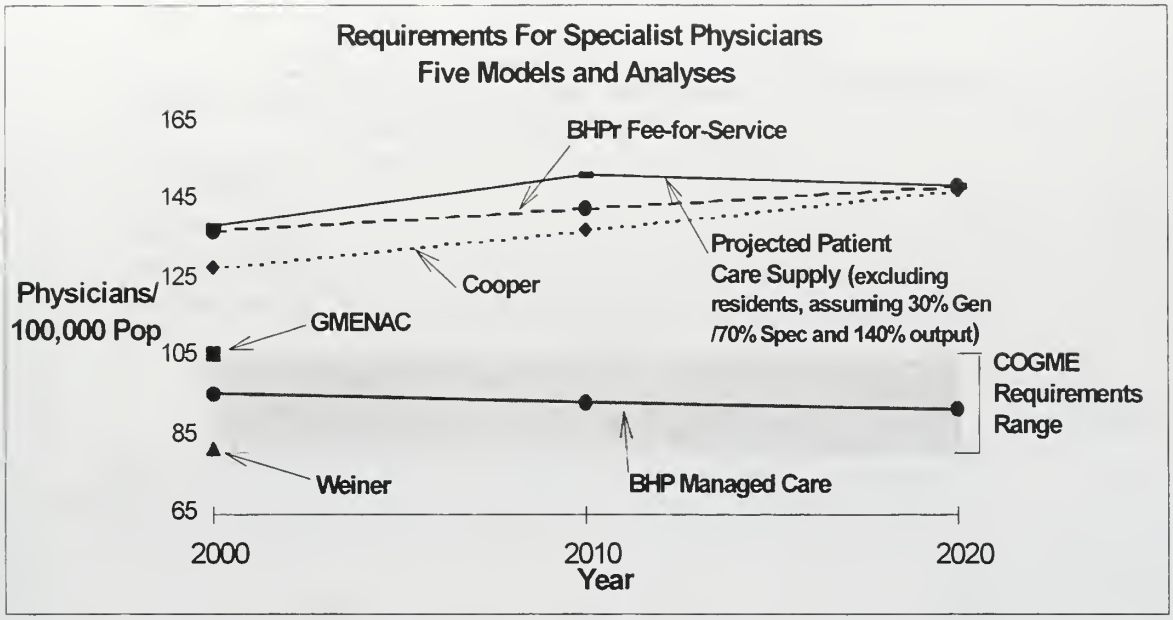

Figure 5. Requirements for Specialist Physicians: Five Models and Analyses

Source: Council on Graduate Medical Education. *Eighth Report*: *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, (Rockville, Maryland: DHHS, November 1996): 9.

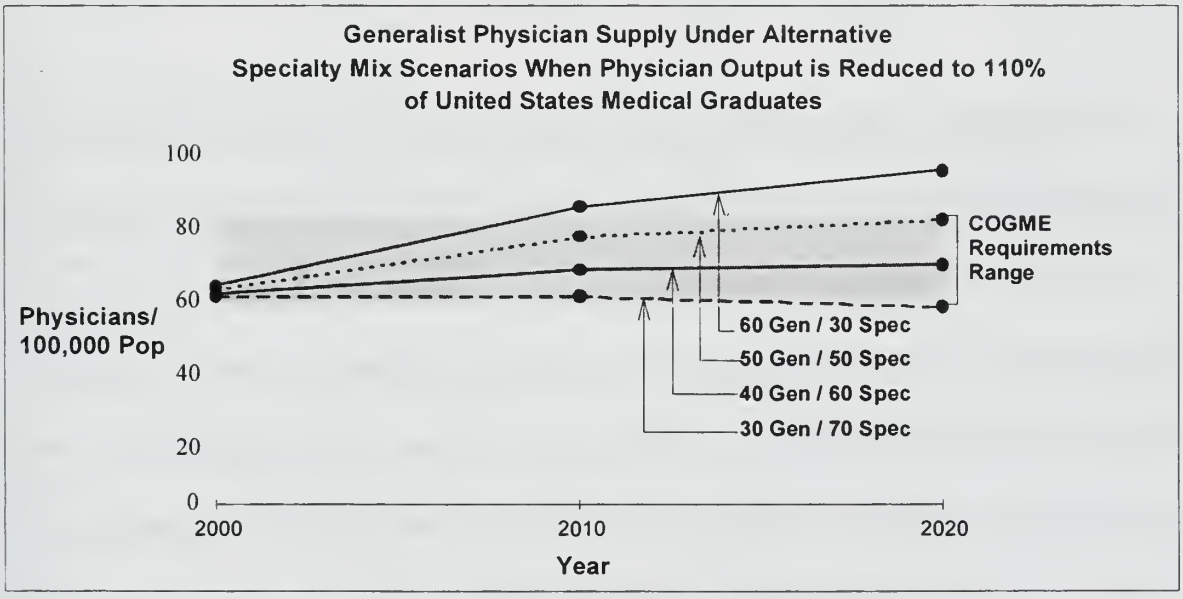

Figure 6. Generalist Physician Supply Under Alternative Specialty Mix

Source: Council on Graduate Medical Education. *Eighth Report*: *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, (Rockville, Maryland: DHHS, November 1996): 16.

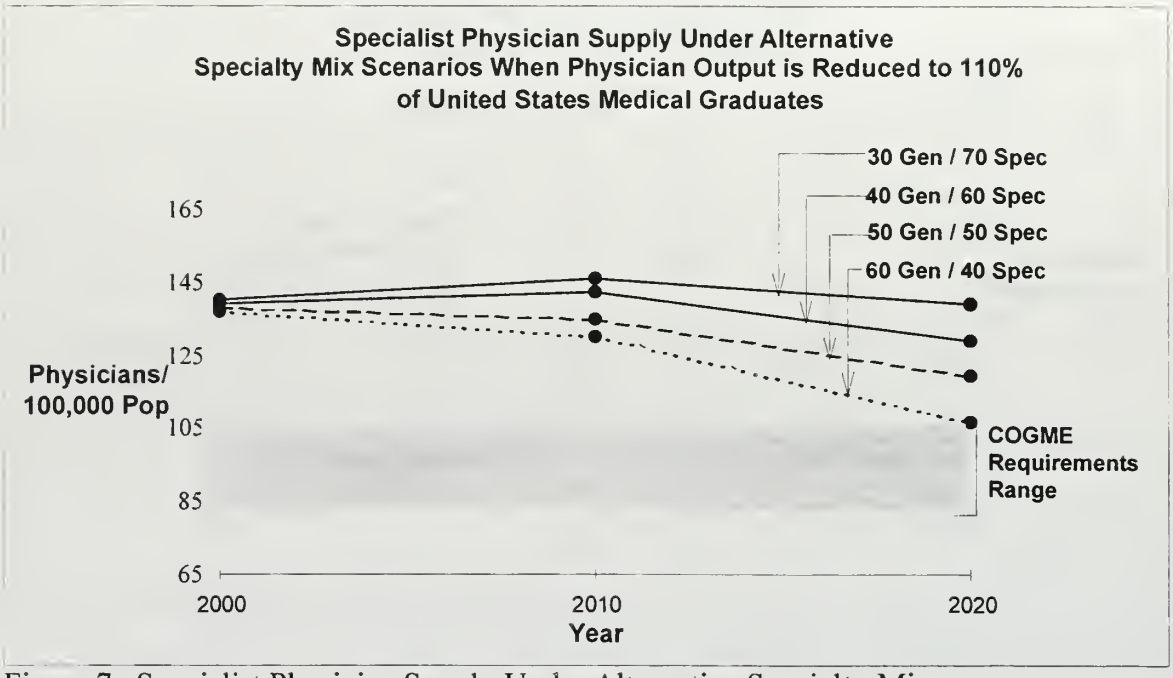

Figure 7. Specialist Physician Supply Under Alternative Specialty Mix
Source: Council on Graduate Medical Education. *Eighth Report*: *Patient Care Physician Supply and Requirements: Testing COGME Recommendations*, (Rockville, Maryland: DHHS, November 1996): 16.

The eighth COGME report did not provide recommendations as to the number of ensuing years from today that GME programs should follow this guideline. In the midst of a physician surplus, the matter of precision in "requirement ranges" may be less pertinent than distinguishing where the system has sufficient elasticity to absorb additional physicians productively. Currently, the system has the capacity to absorb many additional generalists whereas the capacity to absorb specialists is declining.[60] There is a long-term need to ensure the balance in the physician workforce in the years between 2015 and 2030, the period that will be most affected by current policy.[61]

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[60] Ibid., 18.

[61] Cooper, "Seeking a Balanced Physician Workforce" 686.

Figure 8 illustrates that unmanaged fee-for-service health plans currently (1997) make up only 5 percent of US group insurance, while managed fee-for-service is projected to shrink from 55 percent in 1990 to 15 percent by the year 2000.

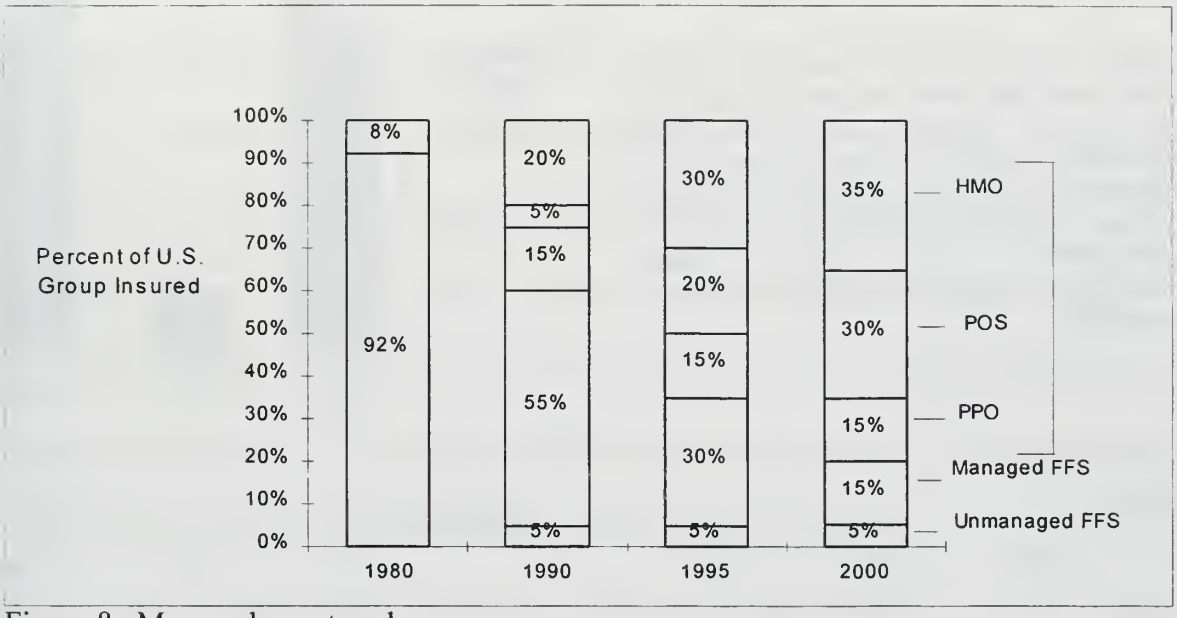

Figure 8. Managed care trends

Source: Council on Graduate Medical Education. *Sixth Report*: *Managed Care: Implications for the Physician workforce and Medical Education*, (Rockville, Maryland: DHHS; September 1995): 10.

Note: The group projects physician demand from the perspective of a nation's health care completely controlled by managed care. This is consistent with the apparent unstoppable evolution and variable growth that managed care is experiencing throughout the United States.

In Figure 9, the Sachs Group projects demand for primary care doctors in the year 2000. Their projections show that in each of the four regions of the country, more primary care physicians and fewer specialists will be needed compared to the mix that exists today.

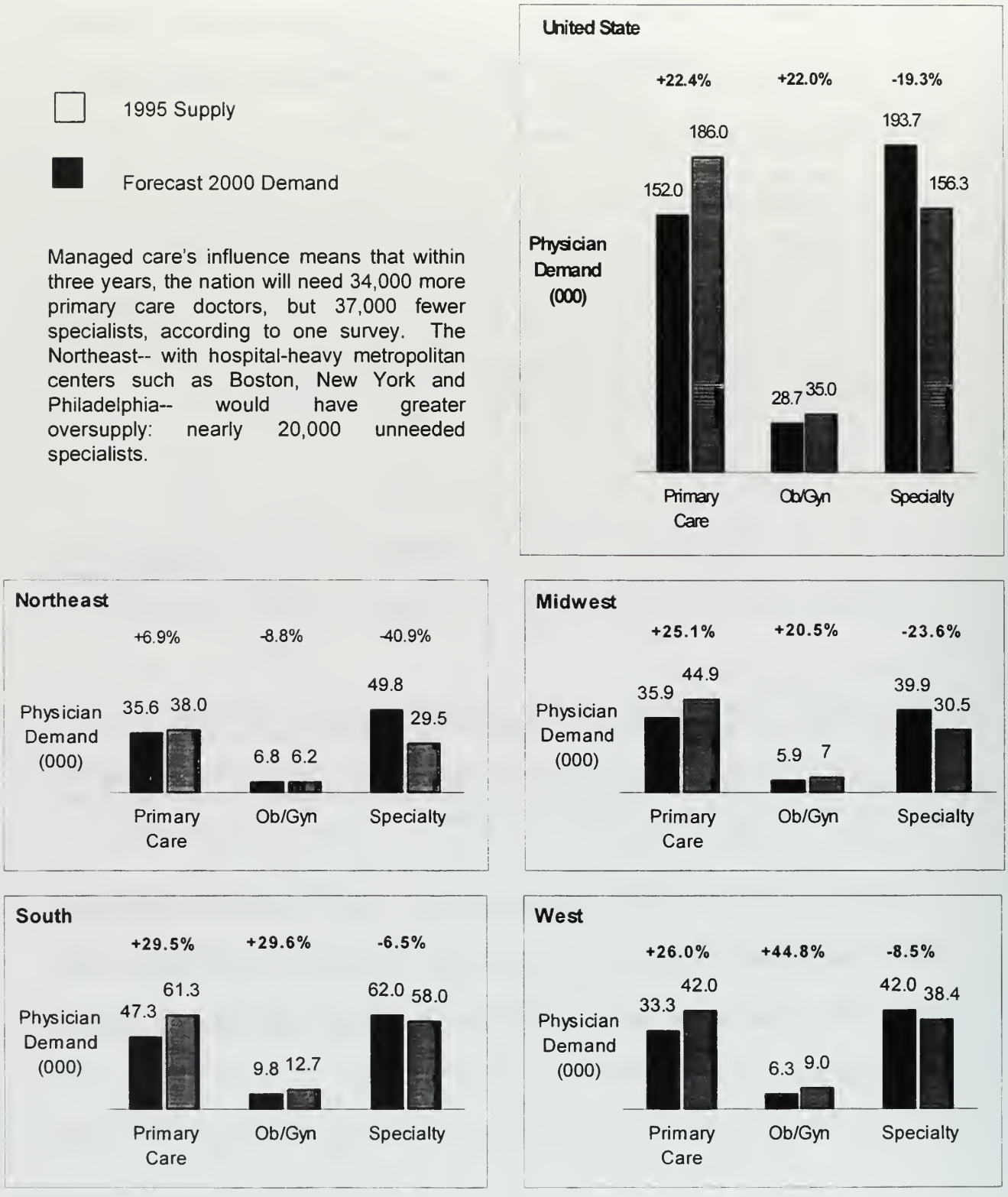

Figure 9. Demand for physicians in the year 2000

Source: Managed Care magazine: Managed Care Outlook, May (1997): On-line.

C. MEDICAL SPECIAL PAY SYSTEM

The Report of the Seventh Quadrennial Review of Military Compensation classifies medical special pay as career incentive pay or skill incentive pay. The long term career incentive pays are designed to close the gap between military pay for specialists and the low end of comparable civilian pay scales. The permanent nature of the pay and the predictability it provides recipients does not require the Services and Congress to make immediate adjustments in the face of retention problems. Skill incentive pays on the other hand are short-term bonuses, and must be responsive to cyclical conditions in civilian labor markets affecting retention. Retention will suffer, or unnecessary payments will be made, to the degree that problems are not identified early and bonus amounts and obligation amounts have not been justified.[62]

Aside from the regular military compensation (RMC) received by all military officers, military physicians also receive medical special pay. Apart from a short-lived, experiment with special pay for "surgeons and surgeons' mate," there was no special pay program for health professional before 1947.[63] In 1980, the entire special pay program for physicians was substantially changed when Congress adopted the Uniformed Services Health Professionals Pay Act of 1980, making the entitlements permanent subject to future Congressional withdrawal. This act defines the present system and created four types of pay: Career incentive pays: (a) variable special pay (VSP), (b) board-certified pay (BCP), and Skill incentive pays: (c) additional special pay (ASP), and (d) incentive

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[62] Office of the Assistant Secretary of Defense. *The Report of the Seventh Quadrennial Review of Military Compensation (QRMC).* (Washington: GPO 1992).

[63] Department of Defense, *Military Compensation Background Papers.* (Washington: GPO 1987).

special pay (ISP). Career incentive pays are paid monthly on a long-term basis and no service obligations are attached. Skill incentive pays are annual bonuses and the recipients incur a service obligation. Whereas career incentive pay is characterized as stable and predictable, skill incentive pay is characterized as short-term and more flexible. All physicians regardless of specialty receive VSP, BCP, and ASP. ISP is a targeted pay that is awarded to address retention difficulties and shortages in critical specialties. Between 1980 and 1988, these special pays lost about one-third of their value due to inflation.[64]

Skill Incentive Pays - ISP is an annual bonus paid to physicians O-6 and below. ISP varies by specialty and does not exceed $36,000 a year. Physicians that accept ISP must agree to remain on active duty for one additional year. Any physician not undergoing internship or initial residency training who agrees to remain on active duty for one year can receive the ASP, a $15,000 annual bonus. In 1989, Congress added a new type of targeted pay called the medical officer retention bonus (MORB), now called the Multiyear Special Pay (MSP). MSP is classified as a skill incentive pay and is awarded to physicians who agree to remain on active duty for 2, 3, or 4 years after completion of any other service obligation. The duration of the agreement determines the amount payable. Annual amounts range from $2,000 to $14,000 and are payable upon acceptance of the agreement and on the anniversary of the agreement. To qualify

[64] Office of the Assistant Secretary of Defense, *Seventh Quadrennial Review*.

the physician must also be O-6 or below and have at least eight years of creditable service.[65]

Career Incentive Pays - VSP is an entitlement for physicians serving on active duty for periods of at least one year. The annual rates range between $1,200 and $12,000 for physicians with six but less than eight years of credible service. After the physician has reach eight years of service, this pay benefit is eliminated based on the hypothesis that expected retirement benefits and other types of special payments will serve as greater incentives for physicians to stay on active duty. BCP is an entitlement for physicians who obtain board certification and annual rates range from $2,500 to $6,000 depending on years of credible service. However, physicians with less then 10 years of service receive $2,500 annually and physicians with 18 years of service or more receive $6,000 annually.[66] MSP and ISP rates are established by the tri-service Flag Officer Review Board. Each year under the auspices of the OASD(HA), the Hay Group conducts a study of civilian physician salaries by specialty. This data is analyzed and used as a basis to determine amounts of MSP and ISP for each military specialty. Table 4 provides a breakdown of the different specialty pays, the number of recipients, and the amount of special pay for fiscal years 1992 to 1997.

A recent GAO report stated that, in general, military physicians were eligible for and receive more types and higher amounts of special pay than Health and Human

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[65] Ibid.

[66] Ibid.

Services (HHS) physicians.[67] However, the average military physician is paid 23 percent less than HHS physicians. The report stated that the average military special pay amount for physicians was $35,190, with a maximum of $79,500 per year. This report went on to say that in comparing military and private physician pay, physicians in general surgery, internal medicine, psychiatry, and family practice were generally paid more in the private sector. In the specialty comparison, thoracic surgery, radiology and anesthesiology, civilian physicians were paid considerably more, based on information from their studies.

Table 4. Special Pay Comparison for Fiscal Years 1992 to 1997

	FY 92		FY 93		FY 94	
	Number	Amount*	Number	Amount	Number	Amount
VSP	4,348	33,900	4,364	33,617	4,336	33,505
ASP	3,297	49,455	3,290	49,350	3,207	48,105
BCP	1,813	6,593	1,899	6,933	1,914	6,998
ISP	1,368	17,810	1,870	29,957	1,932	33,010
MORB	569	6,766	92	1,100	0	0
MSP	674	4,870	776	8,872	953	10,083
Total	12,069	$119,394	12,291	$129,829	12,342	$131,701

	FY 95		FY 96		FY 97	
	Number	Amount	Number	Amount	Number	Amount
VSP	4,219	32,624	4,068	31,506	4,039	30,956
ASP	3,104	46,567	3,074	46,110	3,052	46,117
BCP	1,835	6,931	1,847	7,075	1,859	7,311
ISP	1,985	34,806	2,007	37,211	2,086	39,594
MORB	0	0	0	0	0	0
MSP	986	10,397	986	10,450	997	10,622
Total	12,129	$131,325	11,982	$132,352	12,033	$134,600

Source: Bureau of Medicine and Surgery, Med-52 (Special Pays), (Washington, D. C., November 1997.)

[67] Pay &Benefits: Comparative Analyses of Federal Physicians' Compensation, GGD-97-170 (Washington D.C. 15 September 1997).

The GAO report also looked at the following military non-wage compensation: medical care for the member and their family, disability insurance, housing, commissaries/exchanges, and recreational facilities. Additionally, military personnel (physicians) have the option of declaring a state residence regardless of their duty station. This benefit provides a significant tax advantage since some states have no income tax.

D. REVIEW OF PRIOR STUDIES ON PHYSICIAN PAY AND RETENTION

1. Simon, Dranove, and White

Their study examined the impact of managed care on the employment and compensation of primary care and specialty physicians. The rates of managed care growth and levels of managed care penetration in the marketplace vary across geographical areas. Their study examined the relationship between changes in managed care penetration at the state level between 1989 and 1993 and the corresponding rates of growth in primary care and specialist physician's incomes. Second, they looked at the relationship between changes in managed care penetration and changes in the number of primary care and specialty physicians per capita for the same period. Third, they considered national trends in graduating U.S. medical school seniors' matches with specialty programs for the period 1989-1995.[68]

Their study used data from the American Medical Association's (AMA) Socioeconomic Monitoring System (SMS) surveys to measure physicians' incomes and involvement in managed care over the period 1985-1993. The SMS is designed to be representative of the patient-care physician population. It has a 60-70 percent response

[68] Simon, "The Impact of Managed Care" 222.

rate. The number of respondents is approximately 4,000 annually, corresponding to 1 percent of physicians. The sample of the SMS is drawn from the AMA Masterfile. The AMA Masterfile contains data on the specialty, location, and practice status of all known physicians in the U.S. Responses were weighted for non-response bias using weights developed by the AMA. Data were also drawn from the AMA Masterfile and U.S. Census for the years 1989-1993 to examine changes in physician-to-population ratios. Data from the National Residency Matching Program were used to examine specialty choices of medical school graduates.

The SMS data were used to construct a measure of *managed care penetration* at the state level based on the average percentage of physician revenue derived from a managed care contract. Then the measure of managed care penetration was used to develop an indicator of managed care growth in states by calculating the percentage change in managed care penetration in each state between 1985 and 1993. The states were ranked based on their percentage change in managed care penetration and assigned to quartiles.[69]

Physician Income was defined as net practice income after expenses and before taxes. The annualized rates of inflation-adjusted income growth were computed using the median income by specialty category and state in 1985 and 1993, and the Consumer Price Index was used to adjust the median income for inflation. The annualized rate of change in physician median income between 1985 and 1993, by specialty category and state, was

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[69] Ibid., 224.

calculated and used as the dependent variable in three separate regression equations, one for each specialty group considered.[70]

The study selected three specialty categories to capture the maximum variation in the impact of managed care on different types of physicians: Primary care physicians; medical and surgical subspecialists; and "RAPs" (radiologist, anesthesiologist, pathologist). These categories are also adopted in this thesis for the analysis of physician retention and are further described later.

Simon, Dranove, and White specified a multivariate regression model to look at the effect of managed care penetration on annualized rates of growth in the median income of primary care and specialist physicians. States were assigned dummy variables based on their managed care quartile. Other independent variables were included to control for differences in the socioeconomic and demographic characteristics of each state's population. These characteristics included: state birth rates, percentage of population less than five, percentage of population more than 65, percentage of population nonwhite, percentage of population urban, and per-capita income. The annualized rate of change during the 1985 - 1993 period also was computed for each of the independent variables. Separate regressions were performed for each specialty group.

The results found a significant effect of the growth in managed care on relative primary care / specialty earnings. Income growth for primary care physicians differed significantly across all quartiles, with income growth most rapid in states with high managed care growth. Incomes of "RAPs" grew more slowly in states with high

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[70] Ibid., 226.

managed care growth. Subspecialists had slight income growth in states of all quartiles; however, the differences between them were not statistically significant.

The study also estimated the relationship between changes in managed care penetration and annualized rates of growth of physician supply (primary care and specialists). The study expected to find a positive effect of managed care growth on changes in the primary care physician-to-population ratio and a negative effect on changes in the specialty physician-to-population ratio. Due to the substantial costs incurred from relocating, adjustments in the numbers of physicians are expected to occur less rapidly than adjustments in compensation.[71] The analysis found a relative decline in the supply of subspecialist and "RAP" physicians in areas with high managed care growth rates. The primary care physician-to-population ratio increased at a slower rate than the other two categories in all managed care growth quartiles, and the growth in primary care physicians was lowest for states with the highest levels of managed care growth. This does not support the hypothesis that managed care will drive strong growth in employment opportunities for primary care physicians. Only the results for the "RAP" group were significant, where their ratios rose 40% faster for states in the lowest quartile than in states in the highest quartile.

The last part of the study looked at national trends in specialty selection by medical school seniors using the NRMP data for postgraduate year one and two residency positions offered and filled from 1989 through 1995. Assuming regional changes forecast long-term national trends, medical students were expected to increasingly select primary

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[71] Ibid., 226.

care residencies.[72] The results supported that expectation. As discussed earlier, the number of family practice and pediatric positions filled nationwide rose 32 percent, suggesting that in the long run the changes noted in physician incomes could translate into substantial changes in the relative supply of primary care and specialist physicians.

Overall, the study does support the hypothesized effects. The one exception where geographical areas with increased managed care growth did not lead immediately to more primary care physicians. However, this may be reflective of costs incurred from relocating and the lagging short run adjustment to varied demand in geographical areas.

The only weakness identified in this study is that the results may underestimate the full impact of managed care due to some intrastate variation in managed care penetration that can be concealed by a state-level analysis. The construction of the dependent variable (using the annualized rate of change in income vice income level) minimized the effect of unobservable state-level factors that were unrelated to managed care growth. An advantage to the SMS data used in this study is that it accounts for a wide range of different types of managed care delivery systems whereas previous research has focused on HMO enrollment which constitutes only one-half of the managed care market.

2. Congressional Budget Office

The Congressional Budget Office (CBO) conducted a study in July 1990 to analyze the effect of alternative plans for paying military physicians based on the projected size of the medical corps. This was done through the estimated effects of the

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[72] Ibid., 226.

pay plans on retention rates. Congress had been satisfied with the current pay system's basic structure but was interested in approving incremental changes that might reduce the size and configuration of the medical corps. These changes could include more money for the across-the-board pays, higher incentive special pay, and initiating the multi-year special pay to supplement the other pays.

The analysis started by configuring the military physician work force by medical specialty and accession source. Physicians were grouped into 14 medical specialties that reflected the classifications used by various pay plans and they used three sources of entry groups: Non deferred Health Professional Scholarship Program (HPSP), deferred HPSP, other. Non deferred, or direct, HPSP entrants enter active duty upon completion of medical school and receive graduate education through the military training program. Deferred HPSP entrants defer their active duty service to receive residency training in a civilian training program. Deferred HPSP entrants enter active duty as fully trained specialists. The CBO study used data from a DoD tape containing information about whether or not an individual physician left the service during 1988 to estimate retention rates for each specialty and source of entry combination. This was based on the number of physicians on active duty at the beginning of 1988 who were at the end of, or past, their initial obligation, and who did not leave during the year. The retention rates varied widely for those physicians at the end of their initial obligation and varied over a much narrower range for those in years of service past their initial obligation.[73]

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[73] CBO, "Options for Paying Military Physicians", 7.

A model of retention relating the individual physician's decision to stay or leave to their pay allowed CBO to predict how each of the pay plans would affect the retention rates of physicians. The decision point was defined as "reaching the end of their initial period of obligation." Maximum likelihood estimates of a logit model of individual retention decision were obtained.

The cohort data from the computer tapes had information on individual physicians from all Services who entered the military between 1981 and 1988. The retention decision of 1,786 physicians who came on active duty between 1981 and 1987 and whose initial obligation dates occurred before 1989 (and were at least two years after accession) was obtained from the data. Physicians were stratified by source of entry. This was done to control for initial preference for a military career. Since no non-deferred HPSP students finished their initial obligation before 1989, they were excluded from this analysis: 650 of the 1,786 physicians joined as deferred HPSP students. Over the 1981-1988 period 26 percent of the deferred HPSP and 60 percent of the "others" stayed beyond their initial obligation.

The study estimated a logistic regression for the deferred HPSP group and the "other" group. The explanatory variables included the natural log of the military-to-civilian pay ratio, years of practicing medicine, board certification status, citizenship, and specialty category (primary care or non primary care). The last four variables were meant to capture the non-pecuniary factors that may influence retention. Military earnings (RMC + special pays) were estimated for each physician at the time the initial obligation ended, based on pay grade and years of credible service, specialty, and branch of service.

Earnings varied slightly over time because of congressionally mandated changes to basic pay and allowances and ISP. Between 1981 and 1988, ISP changed frequently in amount and recipient specialties. Estimated civilian earnings were based on AMA data.

When evaluated at the mean values of the other explanatory variables, the equations for both groups gave similar pay elasticities: Deferred HPSP = .7 and Other = .5. Given that these two dissimilar groups are similar in their responsiveness to changes in pay suggests that non deferred HPSP physicians also probably have elasticities in that range. Physician specialty was not a statistically significant explanatory variable.[74]

The CBO study calculated the effects of alternative pay plans, except for the multi-year option, using the estimated pay elasticities from the logit model. Each plan resulted in a percentage change in the pay ratio by specialty, so the percentage change in the retention rate of each specialty could be estimated. Calculating the effects of the multi-year pay was more complicated.

A problem with this study might be the inclusion of the physician specialty categories as explanatory variables. These variables will be correlated with the pay variable. The larger sample size available for the analysis in this thesis examining all military physicians should allow for separate logit models for several specialty categories and control for source of entry with dummy variables in the model. Specialty-specific elasticities will be more useful for analyzing alternative pay plans that are based on targeted pays. The elasticities estimated in this thesis will control for differences between

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[74] Ibid., 61.

specialties. Also, the model should have included explanatory variables on personal characteristics.

3. Center for Naval Analyses

The following summarizes three Navy physician pay and retention studies conducted by McMahon of the Center for Naval Analyses (CNA): A Retention Model for Navy Physicians (1989), Pay and the Retention of Navy Physicians (1989), and Navy Physicians' Pay Distributions Compared to Civilian Income (1991).

a. Retention Model for Navy Physicians (McMahon 1989)

This study analyzed the sensitivity of retention of fully trained specialist physicians in the Navy to pay differentials between the civilian sector and the Navy. The aggregate retention rate for specialists was declining and the results were intended to guide the policy issue of how pay increases could improve retention.[75] It may have been done for the same reason as the CBO study because it applies the estimated specialty-specific elasticities to indicate which specialists are likely to demonstrate increased retention under various alternative pay proposals. At the time of the study there was a positive and growing civilian-military pay differential.

The data consisted of the population of unobligated fully trained specialists on active duty from The Bureau of Medicine Information System (BUMIS) for fiscal years 1983 through 1987. CNA maintains a database that provides calculations on Navy physician income (monetary and imputed). The database also contains background information, including source of entry. The database included all key variables from FY

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[75] Joyce S. McMahon, "A Retention Model for Navy Physicians," *Center for Naval Analyses*, (Washington D.C. June 1989), iii.

1984 to FY 1987. Variation in income was observed across physicians at a point in time and for individual physicians across time. The major source of variation in pay is from the variation in the ISP, and is a limitation of the data for this thesis and of the CBO study.[76]

The BUMIS data did not contain complete information on physicians' pay and was augmented by constructing physician pay from pay schedules. The constructed pay variable RMC included the federal tax advantage due to the nontaxable status of BAQ, VHA, and BAS, and a dependency allowance. All medical special pays were included.

Civilian physician earnings came from the Association of American Medical Colleges (AAMC) because it contained information on 22 specialties over a number of consecutive years. The AMA data was rejected because it only had information to support analysis of nine specialties. The AAMC data was also felt to be a more conservative measure of income. The 22 specialties cover 93 percent of the fully trained navy specialists. The remaining 7 percent did not have good civilian counterpart data.[77] AAMC obtains salary data yearly from over 55,000 full-time medical school faculty. These faculty members have the following ranks: Instructor, Assistant Professor, Associate Professor, Professor and Chairman.

Examination of retention for unobligated specialists reveals a large variation across specialties. Over the 1984 - 1987 period pediatricians showed very

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[76] Ibid., 2.

[77] Ibid., 3.

stable retention rates of 83 percent, while anesthesiologists had retention rates that raised between 54 and 66 percent. There was no clear trend of retention within specialties over time. A higher rate of leaving was noted at the end of the initial obligation relative to the end of a subsequent obligation.[78]

The average military/civilian pay ratio for specialists dropped from 90.8 to 79.1 percent during the observed period. In FY 1988, the average pay gap for a specialist was $24,600. The range varied from $1,200 for general pediatricians to $117,200 for the average cardio-thoracic surgeon.

The decision point in this model is assumed to occur one time each fiscal year, either at the end of an initial obligation or at the end of an annual obligation. The dependent variable was derived from an observation of an individual physician at a decision point. The decision to leave was coded as (1), and the decision to stay as (0). Maximum likelihood logit models were used and focused on the pay differential. Other explanatory variables included number of dependents, age, minority status, years of service toward retirement, an observed propensity toward military life, and the source of entry.

The coefficient of the pay differential variable was statistically significant and verified that the larger the civilian - military pay differential the higher the probability of leaving the Navy. The study found that the other variables were significant also: having dependents was associated with a higher probability of leaving, and both deferred and non deferred HPSP entrants are more likely to leave. Being older, having

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[78] Ibid., 4.

higher rank, being black or female, and being near retirement eligibility were all associated with a lower probability of leaving. The estimate of the aggregate pay elasticity for the overall model was approximately .15.

Results of the model were used to analyze the sensitivity of physician retention to changes in the pay differentials for 22 specialists, but the specialty-specific elasticities were not based on separate specialty regressions for each specialty. Small sample sizes did not permit running 22 models and the study did not aggregate specialists into fewer categories. The β used in this calculation was the aggregate elasticity from the overall model. The actual probability of leaving and an observed pay gap was used for each specialty, based on preliminary FY 1988 data, to calculate pay elasticities separately for each of the 22 specialties.[79] This method still does not account for varied specialty behaviors given that the β is from the overall model. The results did, however, support the expectation that those specialties with the largest pay differentials will show the greatest responsiveness of the probability of leaving for a given percentage decrease in pay. The specialty-specific range was from .72 to .01 with the surgical subspecialists having the highest elasticities and the primary care physicians the lowest.

This study was re-estimated using the natural log of the military-civilian pay ratio as in the CBO study. The fit of the model only changed slightly and the other explanatory variables' significance, sign, and general magnitude did not change. The elasticity however, was estimated as .83, very close to the estimate of .70 in the CBO study. When the .83 elasticity was applied to the data the results are essentially the same

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[79] Ibid., 15.

as the original CNA model. This provides validation of the two approaches. However, the weaknesses for the specialty-specific elasticities are still a concern.

b. Pay and the Retention of Navy Physicians (McMahon, 1989)

McMahon's study examines three distinct pay plans proposed to diminish the civilian-military pay gap. This is done by examining the expected costs, the projected impacts on retention of physicians by specialty, and the long-run effects for force management in the Navy. The study recognized that other factors also influence retention such as working conditions, but these are more difficult to quantify, analyze, or change quickly.

The data included military physician pay and demographic information. This was obtained from BUMIS for FY 83 - FY 87 in order to construct the population of fully trained physicians specialists who were on active duty during this period. Data on their civilian counterparts was obtained from AAMC. The sample was large enough to supply information on 22 specialties. Once all the data were received military physician pay was computed and contrasted with alternative civilian pay by specialty.

CNA's analysis of the data showed that the civilian-military pay differential was positive and growing for fully trained Navy physician specialists. This growing gap would likely have some disastrous effects on retention as the civilian employment opportunities became increasingly attractive. The study showed retention rates at the end of the initial obligation, the first career turning point had declined, as did the inventory of fully trained specialists.

The logit model used to analyze physician retention focused mainly on the influence of the civilian-military pay gap, while recognizing that many factors that affect the member's choice to stay or leave. These other factors were personal characteristics, such as years of service toward retirement, taste for military life, the source of entry and dependents, among others.

The study concluded that because of the decline in retention and the growth of the military-civilian pay gap, an argument could be made for boosting the pay for military physicians. In considering new pay proposals, those in Table 5, there were two key issues to consider: the proposed pay had to offer military physicians more comparability with their civilian sector alternatives and it had to address the manpower shortage issue.

Table 5. Comparison of proposed alternative pay plans

Pay plan	Pay raise	Coverage
Plan I	48-percent cost of living adjustment to all special pays, excluding ISP	All physicians eligible for special pay
Plan II	Pay alternative civilian median if FY88 inventory is less than 90 percent of the FY90 authorized end strength	All fully trained specialists who are unobligated
Plan III	Pay 90 percent of the alternative civilian median income. Use a save-pay clause to avoid decreasing military pay to specialties currently above 90 percent	All fully trained specialists who are unobligated

Source: Joyce S. McMahon, et al, *CNA Research Memorandum 88-266, Pay and the Retention of Navy Physicians*, (Washington, D.C., CNA: May 1989), 18

The alternatives were evaluated on their retention effects and total costs as found in Table 6. The retention effects were compared to a 1989 baseline plan, which estimated 310 fully trained and unobligated physicians leaving the Navy. Under Plan I, 23 physicians would be retained. Plan II and III would retain 38 physicians. The total

costs of these three plans ranged from $13.8 to $15.2 million. CNA acknowledged that the model may underestimate retention effects, particularly for Plans II and III, because the proposed pay increases for certain specialties were "beyond the range of variability in military pay from FY 1984 through FY 1987."

Table 6. Evaluation of expected outcomes of alternative pay plans

Pay plan	Total cost ($ millions)	First-year additional retention	Avg. pay increase in Current dollars	Avg. pay increase (percent)
Plan I	15.2	23	8,500	10.8
Plan II	13.8	38	13,400	16.0
Plan III	13.7	38	13,300	15.9

Source: Joyce S. McMahon, et al, *CNA Research Memorandum 88-266, Pay and the Retention of Navy Physicians*, (Washington, D.C., CNA: May 1989), ix

Under Plan I, all eligible physicians would receive between $8,200 and $9,600. The problem with this plan is that physicians with high alternative civilian incomes receive about the same pay as those physicians who are already receiving compensations relative to their civilian alternative. This subsequently encourages retention of pediatricians, family practice physicians and others that are paid relatively well.

There would be little effect under Plans II and III on family practice, pediatricians and other physicians with relatively small civilian-military pay gaps, as these plans focus mainly on increasing pay for specialties with high-income civilian alternatives. In comparison, Plans II and III are much better plans than Plan I. They would both save more procedural-based (surgeons) physicians who would otherwise

leave the Navy. Plan II can address existing shortages more efficiently, whereas Plan III is simple to calculate and could prevent civilian-military pay gap distortions and subsequent retention problems.

c. Navy Physicians' Pay Distributions Compared to Civilian Income (McMahon, 1991)

This study determines actual pay distributions observed for 22 physician specialties and documents the size of the civilian-military pay differential for three skill levels within each specialty. These pay differentials are then linked to the acceptance patterns of the Medical Officer Retention Bonus, thereby allowing this study to evaluate the impact of the MORB and impact of future pay plans.

An evaluation of all military and physician special pays were calculated in the overall physician compensation. This included the non-taxable allowances: basic allowance for quarters (BAQ), variable housing allowance (VHA), basic allowance for substance (BAS), family separation allowance (FSA). The taxable pays were: career sea pay and hazardous duty pay. The special pays were: VSP, ISP, BCP, ASP and the 1989 MORB. Of all the special pays, the only two that varied across specialties were the ISP and MORB.

Compensation profiles for Navy physicians were calculated by obtaining data from the Joint Uniform Military Pay System (JUMPS) database for four quarters in 1989. The annualized compensation figures obtained were based on fully trained active duty physicians. In addition, the JUMPS database was merged with the Officer Master File and the MORB data to obtain personal data and identify MORB payments.

Physician annual compensation was computed and presented for 22 different physician specialties by pay grade. The pay grades that were most commonly observed for fully trained specialists were O4, O5, and O6. Data on civilian compensation levels obtained from the AAMC most closely matched Navy pay grades, O4 - O6, by the use of assistant professor, associate professor and full professor, respectively. Civilian compensation amounts represented the physician's net income before taxes, but after expenses. This income is based on regular faculty salaries plus any supplemental income from other sources.

In analyzing the effects of MORB on retention, an examination of orthopedic surgeons revealed that MORB was not appealing to junior orthopedic surgeons even though they were eligible for the bonus. The study showed that in 1989 an O4 orthopedic surgeon faced a pay gap of $78,300, while O5's and O6's faced pay gaps of $92,000 and $94,900 respectively.

Four-year MORB contracts were accepted by most O6 orthopedic surgeons, thereby reducing their gap to as little as $74,900. On average, O6 orthopedic surgeons have chosen to be career Navy physicians. The MORB for them is like icing on the cake, because they planned to remain in the Navy anyway. This is not the case for the O4 orthopedic surgeon who has an average of 15 years to go until eligible for retirement. They did not see a benefit of accepting the MORB, which would reduce their pay gap from $78,300 to $58,600. In 1989, of the 66 orthopedic surgeons O4 and below, more than half were eligible for the MORB; however, only one accepted the

contract bonus.[80] As for the 16 orthopedic surgeons in pay grade O5, most were eligible for the MORB, but only five accepted. The average O5 orthopedic surgeon has 12 years of service and is much closer to retirement eligibility.

Analyses of future pay plans should consider several factors in attempting to increase retention of navy physicians. The first is to acknowledge the variety of income levels within and between pay grades and specialties. The second is to acknowledge the variation of alternative incomes across specialties in the civilian sector and the pay differences as compared to Navy physicians. Lastly, levels of special pay and bonuses need to be correctly targeted to those specialties that have genuinely large civilian-military pay differentials, critical needs, or manpower shortages.

[80] Joyce S. McMahon, "Navy Physicians' Pay Distributions Compared to Civilian Income", *Center for Naval Analysis*, (Washington D. C. August 1991).

III. MULTIVARIATE MODEL DEVELOPMENT

A. INTRODUCTION

This chapter describes the conceptual framework for the specification of the multivariate model of retention. It provides a description of the data set using the HMPDS file from the Defense Manpower Data Center and the civilian physician compensation data from the Association of American Medical Colleges. The dependent variable is based on the physician's retention behavior. The chapter also lists the explanatory variables in the model and their expected effects on the physician retention decision. It delineates the data analysis using a statistical model to determine the probability that a physician would remain in the Navy, based on the selected explanatory variables. This chapter also examines the "goodness of fit" of the model, and the elasticities, and marginal effects of each variable.

B. CONCEPTUAL FRAMEWORK

An analysis of physician retention is based on the ability to define the critical factors affecting career decisions. The decision to stay or leave can be considered a decision to seek civilian employment rather than Navy service. Rarely would a physician decide to leave the Navy unless it was to practice medicine in the civilian sector. Several variables are involved in the retention decision but the economic elements are expected to serve as the primary factors affecting this decision.

The model developed for this analysis assumes that physicians are utility maximizers. The basic human capital theory of mobility is a model of voluntary turnover

- deciding whether or not to quit.[1] For the purposes of this analysis, voluntary turnover equates to the issue of retention. The value of the net benefits of voluntary turnover determines the retention decision. While both pecuniary and non-pecuniary factors contribute to utility, it is assumed that on average physicians are income maximizers and that pay contributes positively to utility. Human capital theory predicts that a Navy physician will have a greater probability of seeking civilian employment if the civilian job provides higher earnings, all else equal. Low retention rates for physicians are a signal that their military pay is below market equilibrium.[2] Therefore, one of the major factors to consider is the amount of pay ("spot" value) a Navy physician receives compared to the pay that could be earned as a civilian physician.

Another implication of the theory is that Navy physicians are more likely to leave the Navy when labor markets are stable.[3] An examination of fluctuations in physician demand in the civilian market would therefore be of interest when evaluating retention, especially with respect to the variation in demand across specialties.

Human capital theory also supports the expectation that Navy physicians who are older or have more job tenure are less likely to leave because they represent physicians who

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[1] Ronald G. Ehrenberg and Robert S. Smith, *Modern Labor Economics Theory and Public Policy* (New York: Harper Collins College, 1994).

[2] Ibid.

[3] Ibid.

have probably made a good job-match decision. This relationship may be associated with higher rank and/or years of service, and the pull of the retirement annuity.

If the sample size permits, a separate regression will be performed for each specialty category. If the sample size does not allow for individual specialty analysis, specialties containing a small "n" will be grouped according to the Simon, Dranove, and White study or the Hay Physicians' Total Compensation Survey.[4] The physician specialty groupings will be determined in part on the sample size of each medical specialty from the data and based on the variation in the impact of health care reform (managed care) on the different specialties. The Simon study uses the following groupings: the "Primary Care," physician category for the family/general practitioner, general internal medicine, or general pediatrician; "Medical and Surgical Subspecialty" category for the surgical or internal medicine subspecialtist who typically provides very little primary care; the "RAP" category for the radiologist, anesthesiologist or pathologist. RAPs are distinguished from other specialists because they provide virtually no primary care and historically are closely associated with inpatient hospital services, which is highly affected by health care reform.

The Hay study uses similar groupings. The "Primary Care" category is defined the same as the Simon survey. "Hospital-Based"category uses the same breakdown as Simon's "RAP" category and includes emergency medicine. The "Procedure-Based," physicians category includes general surgery, orthopedics, and neurological surgery, and cardiovascualr/thoracic surgery. The "Office-Based" category includes otolaryngology,

[4] Robbins, 34.

gastroenterology, dermatology, and other specialties. The thesis will use categories similar to the Hay Group, when breaking down the specialties into groups.

According to Simon, Dranove, and White it is more difficult to predict the impact of managed care on obstetrics/gynecology, emergency medicine, and psychiatry specialties than on others. OB/GYNs for example, frequently deliver a mix of primary and specialty care. The military-specific specialties of aviation medicine and undersea medicine are also excluded because of the difficulty of predicting the impact of managed care on this group because the group would yield too few numbers of Navy physicians for meaningful analysis, and because there is no civilian equivalent.

The "Primary Care" category is expected to observe a widening pay differential over the last few years and a higher probability of leaving the Navy in favor of civilian employment. This is an interesting effect to observe. Typically this category of physicians has not been the recipient of rapid growth in civilian earnings, nor have they been a targeted category for retention management by Navy personnel planners. Managed care has significantly affected hospital-based physicians; so the "RAP" category may be observed to have a higher probability of staying. Physician income growth has increased only slightly among the "specialist " category in the Simon study. The expected retention behavior for this category is uncertain. However, it would be surprising if the retention of the "specialist" has not changed since the civilian to military pay gap is shifting.

This thesis examines retention rates among the proposed physician specialty categories, using cross-sectional data, in the years 1992 through 1996. These retention rates will be compared to those in the years 1984 through 1987. This will allow for a comparison

of retention rates before and after health care reform and managed care growth impacted civilian physician earnings. Again, prior studies grouped the physician specialties differently, so it may be beneficial to calculate retention rates among Navy physicians in the years 1984-1987 based on the proposed Hay Group specialty grouping. Retention rates among the specialty categories over time (1992-1996) will also be observed to see if retention has varied by specialty during managed care growth.

The retention model in this study includes a time-varying index of managed care growth to observe whether managed care has had an effect on the retention of Navy physician specialists. The managed care index will be absorbed by regional physician compensation survey data. The Hay data uses ten regions, while the AAMC data uses four. This provides the same impact as the managed care penetration index. The model will estimate the pay elasticities for each specialty category, using logit models. The pay elasticities can then be compared to the pay elasticities observed in prior studies, where a managed care environment was not an influencing factor. The specialty-specific elasticities will be calculated similarly to Dr. McMahon's CNA study, so some assumptions about the pay effect on specialty-specific retention behavior will allow a meaningful comparison.

C. DATA DESCRIPTION

There are three principal data sources for this study: the Health Manpower Personnel Data System file and the physician compensation survey from the Hay Group and the Association of American Medical Colleges. The HMPDS file contains one record for each service member for the Army, Air Force, and Navy medical communities. This is a pooled, cross-sectional data set encompassing the years 1992 through 1996. The file is a

combination of data received from the Active Duty File, the Reserve File and a special pay tape that are submitted by each service on a yearly basis. The file contains information encompassing five major areas: primary and medical specialties; education data, including intern and residency status; pay information detailing various medical specialty pays; information about current assignments; and personal characteristics and other demographic data. This thesis will observe Navy physicians from the selected specialties who are unobligated at the decision point for each of the five years. The decision point is not restricted to the first career decision point, which occurs after initial obligation expires. Physicians will be observed at the initial obligation point and subsequent annual decision points associated with some special pay agreements.

The military pay will include regular military compensation (RMC)(base pay, BAQ, VHA, BAS) plus applicable special pays (VSP, ASP, ISP, BCP, MSP). Military earnings will be estimated for each physician at the year of their decision based on pay grade, years of creditable service, and medical special pays. Creditable service includes all periods that the officer spent in graduate medical education while not on active duty and all periods of active duty as a medical corps officer.[5] Variation in earnings will be observed across physicians at a point in time and for individual physicians across time. Military earnings probably will not vary much over time and may be a weakness with this data set. Currently all Special Medical Pays are collected in the HMPDS database. Social security numbers from the HMPDS file will be matched with the Joint Uniform Military Pay System (JUMPS)

[5] Assistant Secretary of Defense, to Secretary of the Army, Navy, and Air Force, 21 August 1997, Memorandum "Fiscal Year (FY) 1998 Medical Officer Special Pay Plan," Health Affairs, Washington D.C.

file to permit calculation of RMC. The RMC is then added to the physician's special medical pays to produce the total military pay.

There are a number of sources of information on the earnings of civilian physicians that could be used to measure the civilian income alternatives of Navy physicians. The three main organizations that collect information on civilian physicians' compensation were reviewed. These sources were the American Medical Association (AMA), the Hay Group, and the Association of American Medical Colleges (AAMC). The thesis uses similar criteria as prior CNA studies regarding the civilian-military pay differential and retention. The first criterion is the civilian data must span from the years 1992 through 1996 and allow for pay comparisons. Second, the earnings information should be stratified by medical specialty and by experience level within each specialty. Third, the sample size in each category must be large enough to support statistical analysis. Last, the measurement of civilian pay alternatives should be conservative to ensure against overestimating the civilian-military pay gap.

The AMA data collects earnings information by surveying approximately 4,000 physicians using the Socioeconomic Monitoring System. However, the sample size only supports a stratification of nine specialties. After stratification, the sample does not provide information on experience levels, and is not available for all of the years in this study.

The Hay Group is a human resources consulting firm who provides integrated solutions to organizations seeking rapid, sustainable change.[6] The Hay group provides compensation and informational services to organizations to help them determine competitive pay and benefits levels. The Hay Group surveyed 158 health care organizations, providing data representing 20,000 physicians. This survey represents physician compensation in a rapidly changing health care environment. This is accomplished by representing health care organizations from different industry sectors and geographic locations. Health care organizations are categoried by the following industry sectors: (45%) group practice, (37%) HMO, and (18%) hospital/medical center. The survey represents physicians in nine regions. The Hay Group provided a custom report to DoD based on the information in their databases. The survey data is currently used annually by the Navy to determine multi-year specialty pay.

Although the Hay data provides a managed care representation of earnings in the private sector, the survey has limitations when used to compare military and civilian earnings. The Hay data stratifies physicians into 20 specialties. Although this provides more stratification than the AMA data, it does not cover the twenty-two specialties in our study, leaving gaps when making earnings comparisons. In calcuating pay differentials, this forces one to group three surgical subspecialties (plastic, neurological, and cardiovascular/thoracic surgery) into one category. One must also group internal medicine subspecialties such as cardiology and gastroenterology together into one category (internal medicine subspecialties).

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[6] Hay Group Online. Available: Http:/www.haygroup.com/na/service.html; Internet accessed November 1997.

The second limitation to the Hay data is that it does not provide experience levels in each specialty. One is forced to compare both an O-6 and O-4 specialist to the same Hay survey earning amount. For example, an O-4 Radiologist earning $105,400 and an O-6 earning $130,200 are compared to a single civilian pay of $227,700. The process of grouping surgical specialties into one element gives less latitude and inaccurately estimates the pay differential for three surgical subspecialties and the internal medicine subspecialties.

Thirdly, we are concerned with the geographic representation of the survey respondents. California is one of nine regions in the survey, yet it represents 40 percent of respondents. The densely populated New England region, which includes New York and Massachusetts, represents only 8 percent of survey respondents. Managed care growth ranges from 30 to 40 percent for the New England region. Further limitations are that the Hay survey does not separate fixed income with supplemental income, and does not account for malpractice insurance.

The AAMC data contain information on medical school faculty salaries for the academic year, similar to the government fiscal year. The AAMC receives about 60,000 survey responses. This is fifteen times the sample size of the AMA and three times the size of the Hay survey. The AAMC survey accounts for managed care penetration through geographic location of respondents similar to the Hay survey. The AAMC divides the respondents into four regions rather than nine for the Hay survey. The earnings information contained by the AAMC includes fixed base salaries, not influenced by practice earnings, and the supplemental component derived from practice earnings, whether they are institutional or outside. The academic data have less variation in among the lowest and

highest paid specialties compared to the other alternative data series. The AAMC data are stratified by 22 specialties, which gives greater latitude with respect to surgical specialties than the AMA and Hay Group data series.[7]

Distributions for annual compensation were calculated for 22 specialties by pay grade. This study matches the Navy O-4 through O-6 pay grades with data from the American Association of Medical Colleges (AAMC) obtained for assistant professor, associate professor, and full professors. The AAMC data are based on faculty salaries plus supplemental income from outside sources. The AAMC data were used due to relatively large sample sizes, consistent reporting from year to year, level of specialty detail, comparability with regard to non-monetary compensation, and comparability to previous CNA studies which used AAMC data. Additionally, AAMC data represent physicians who have employer fringe benefit coverage and malpractice insurance, conditions that are comparable to those of Navy physicians.[8]

The AAMC provides salary data on physicians employed as medical college faculty. Trends in civilian physician earnings across time can be observed with more variation than for Navy physician earnings over time.

D. OBLIGATION

The review of an officer's initial obligation helps illustrate overall patterns of retention and experience among Navy physicians. Previous studies have defined obligation

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[7] Academic salaries are not the perfect substitute for private sector earnings. The study used academic salaries, because it was the best civilian salary data available that pertained to civilian positions comparable to Navy physician duties and experience. A review of research on Navy retention and pay suggests that AAMC data provide a measure of civilian compensation as good as non-academic earnings.

[8] Joyce S. McMahon, *Navy Physicians' Pay Distributions Compared to Civilian Income*, CNA (1991).

in various ways. The thesis uses Amy Graham's definition from a CNA report titled "Defining the Initial Obligation for Navy Physicians."[9]

The concept of an initial obligation for Navy physicians is explained for both General Medical Officers (GMO) and specialists. The initial obligation for GMOs is the obligation that the physician incurs through an accession program.[10] The initial obligation for specialist is the obligation that the physician incurs through accession and any Navy residency training programs.[11] Obligation for a second residency initiated while under obligation for training or accession programs is considered part of the initial obligation.

Identifying initial obligation with the available data from DMDC and BUMIS is a complex process, because the length of obligation varies with accession program and training pipeline. Amy Graham's study reveals that the length of initial obligation varies from 2.6 to 7.5 years.[12] Retention at the completion of initial obligation varies by specialty and accession program. Generally, direct accessions have higher retention rates than the Armed

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[9] Amy E. Graham, *Defining Initial Obligation for Navy Physicians*, (Center for Naval Analyses, February 1989).

[10] Ibid., p. v.

[11] Ibid.

[12] Ibid., p. iv

Force's Health Professions Scholarship Program.[13] The completion of initial obligation seems to be the career decision point for Navy physicians.[14]

This study attempted to track obligation by using two variables from the BUMIS file. The obligated service date (OSD) identifies the year and the month in which the physician's most recent obligation ends. The obligated service code (OSC) identifies the type of program for which the physician specialist is obligated. Identifying the end of an initial obligation requires a substantial amount of information on each physician. This study was unable to precisely determine the end of initial obligation with the available data from BUMIS because BUMIS does not directly record the length of an obligation that a physician incurs. A non-deferred scholarship participant may be obligated for four years, while a direct procurement physician may be obligated for two, three, or four years. The majority of BUMIS obligation data for an individual's obligation prior to the most recent obligation date was inconsistent. Using the most recent obligation date, it is not possible to determine whether a physician is serving under a subsequent obligation or at the end of initial obligation. Additionally, a physician who passed the initial obligation point may augment or incur an obligation for other reasons. To overcome these limitations, a longitudinal database needed to be created across time for each individual record. Therefore, the model looks at the retention of physicians under both their initial obligation and their subsequent obligation. No attempt was made to identify physicians at the end of their initial obligation.

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[13] Ibid., p. vii.

[14] Ibid.

E. VARIABLE SPECIFICATION

1. Dependent Variable Specification

The physician's actual behavior in a given category is the dependent variable. SSNs are matched to the loss file to obtain information on the retention behavior. If a physician is observed at year *t* and not observed at year *t+1*, the retention decision was to leave (time period = 1992 - 1996). The binary dependent variable is named *Stay* and coded as a (1) when the physician stays and (0) when the physician leaves.

2. The Explanatory Variables

The factors chosen for inclusion in the model are largely based on McMahon's previous CNA study. Each variable is defined below. Following the variable explanation, Table 7 lists the explanatory variables proposed for the model and their expected effects on the physician retention decision.

a. Military/Civilian Pay Differential

The current-year military/civilian pay differential is the variable of primary interest and is labeled *Paydif*. The other variables are selected because they are likely to influence the stay/leave decision and need to be included in the model to correctly estimate the true independent effect of *Paydif*. Physician military pay is obtained by summing regular military compensation (basic pay, BAQ, VHA, BAS) and applicable medical special pays (VSP, ASP, ISP, BCP, MSP). Comparable civilian physician pay data is obtained from the AAMC. The method of calculating *Paydif* is based on prior CNA studies described in Chapter II. The individual physician's military pay is subtracted from their civilian physician counterpart, and is based on specialty and experience level. Experience levels used

for Navy physicians are those most commonly observed for fully trained specialists in pay grades O4, O5 and O6. These pay grades are comparable to AAMC's assistant professor, associate professor, and full professor, respectively. The expected effect is that the higher the value of *Paydif*, the higher the probability that a physician will leave the Navy. This is, the greater the civilian to military pay gap, the greater the incentive to leave the Navy. All physician specialty groups would be expected to leave the Navy as the pay gap widens. However, the magnitude of the effect may differ significantly. This effect can be captured in the specialty -specific elasticities that measure the percentage change in the probability a physician will leave with respect to the percentage change in the pay ratio.

b. Marital Status

Family responsibilities, whether it is a spouse or child, may affect a physician's decision primarily due to the involuntary mobility associated with military service that can be disruptive to family lifestyles and goals. The data file lacked information on children, so the study looks at the effects of whether a physician is married. The variable is named *Married* and is a dummy variable controlling for the effects of having a dependent. If the physician is married at the time of the decision then *Married* = (1); otherwise *Married* = (0). There is no distinction made between a spouse and children in specifying the variable. A single officer without dependents is assumed to be more consistent with a Navy lifestyle. The presence of dependents is expected to lead to a lower probability that a physician chooses to remain in the Navy.

c. Rank

A higher rank is assumed linked with positive non-pecuniary factors and an indicator of a good job-match. The higher-ranking physician is therefore more likely to stay. A set of dummy variables for *Rank* will be used for O4 through O6 and coded as (1) if the physician holds the indicated rank at the time of the decision, and coded (0) otherwise.

d. Minority Status

Minority status may have an impact on the attractiveness of Navy employment. However, how it influences the decision will depend on the perception by minorities that opportunities are better or worse in the Navy. The expected effect is therefore uncertain. Possibly since EEO programs are relatively extensive in the military service, racial minorities may feel opportunities are better in the military and more likely to stay. This variable is named *Minsta* and is coded (1) if the physician was nonwhite and (0) otherwise.

e. Gender

This variable is named gender and is coded (1) if the physician is female and (0) otherwise. The expected effect is that females will have a higher probability of remaining in the Navy.

f. Years of Service (YOS)

To capture the effect of military retirement on the stay/leave decision, it is assumed that, ceteris paribus, the more years of creditable service toward retirement a physician has the more likely he or she will stay. After 20 years of creditable service it is assumed that the observed probability of a decision to stay will decrease. This interpretation

is an attempt to control for the effect of military retirement incentives without the complex procedure of converting the incentives into a discounted present value framework. The expected relationship is that the greater years a physician has in the Navy the more likely they will stay. This variable is named *YOS* and measures the length of years of service at the time of the decision. The YOS variable is broken down into four separate dummy variables (YOS1=0-9 years of service, YOS2=10-14 years, YOS3=15-19 years, and YOS=20+ years). This variable and *Age* may be collinear.

g. Procurement

Procurement may be a strong predictor and worthy of examination, based on results of McMahon's CNA study where non-deferred (direct) HPSP entrants were associated with a higher probability of leaving and deferred HPSP entrants were twice as likely to leave than non-deferred HPSP entrants. This relationship may offer insight for future retention management. It may also indicate a difference in the propensity for military service (as believed in the CBO study). The categories chosen are the deferred and non-deferred Armed Forces Health Professional Scholarship Program (AFHPSP), Uniformed Services University of the Health Sciences (USUHS), direct accession and other. These categories will be represented by a set of dummy variables and coded as (1) if the physician was commissioned via the indicated source.

h. Age

Older physicians are more likely to have better information regarding optimal job-matches so they would have made an informed choice when they joined the Navy and are therefore less likely to leave than younger physicians. The variable named *Age* is defined

as the age of a physician (years) at the time of the retention decision. However, age was taken out of the model, because of the high correlated with rank and years of service.

i. Taste for Navy life

Propensity for Navy life is another factor that is difficult to quantify. Our model is designed to measure the decision to leave or stay on an annual basis, so it is possible to observe repeated decisions to stay by the same physician. Controlling for the other factors, it will be assumed that repeated observations on the same unobligated physician indicate a high taste for Navy life. One decision to stay will likely increase subsequent decisions to stay. However, the dummy variable for *Taste* was taken out of the model, because of the high correlation with the dependent variable of the stay/leave decision.

Physician dissatisfaction with working conditions is likely to impact on the decision to leave. However, collecting information on this factor and measuring it correctly is extremely difficult. Survey data and factor analysis would need to be part of this study. This study excludes the perceptual variable of job satisfaction. McMahon's position was that failure to account for this factor will weaken the overall predictive ability of the model for a given physician, but that across all physicians the effects should not add bias, or lessen the predictive ability.

Table 7. Explanatory variables with the expected sign of regression coefficient

Variable (at time of decision)	Expected Sign of Regression Coefficient	Definition
Paydif	(-)	Continuous: Range: >0; <1
Married	(-)	Categorical: married = 1; else 0
Rank	(-)	Categorical: O4 =1; else 0
	(+)	O5 =1; else 0, O6 =1; else 0
YOS	(-)	Categorical: YOS1=1; else 0
	(+)	YOS2=1; else 0, YOS3=1; else 0
	(-)	YOS4=1; else 0
Procure	(-)	Categorical: DHSPS =1; else 0
		NDHSPS =1; else 0
	(+)	USUHS =1; else 0 DIR = 1; else 0
		Other =1; else 0
Minsta	(+)	Categorical: Minsta=1; else 0

F. STATISTICAL MODEL

A logit model will be used to determine the probability that a physician would leave the Navy, given the independent variables. Logit models are appropriate because the dependent variable, Y, is dichotomous. The dependent variable is derived from an observation of an *individual* physician at the decision point (end of an obligation period and each subsequent year). The stay/leave decision is represented by1 if the physician stays in the Navy and 0 if the physician leaves. The logistic regression model which utilizes maximum likelihood estimation is a more appropriate estimation procedure than linear multiple regression models using ordinary least squares. Most important, a linear regression

model estimated with OLS to predict stay or leave decisions may result in predicted values greater than 1 or less than 0. This would not make much sense, so the preference is a nonlinear technique. The logistic regression model specifies that all predictions fall within the 0-1 range.[15]

The dependent variable measures retention behavior as the log of the odds ratio of the probabilities of the physician leaving or staying. A realistic assumption would be that the probabilities change more slowly as they approach 0 or 1. The effect of a unit change in Xi on P is greatest when P = 0.5 and least when P is close to 0 or 1. Changes in the independent variables will have their strongest effect on the probability of leaving or staying in the Navy at the midpoint of the distribution. A physician with a strong preference to leave the Navy will not be nearly as influenced to remain in the Navy despite more pay, as the physician who is on the fence about the stay/leave decision. This assumption is reflected in the cumulative logistic distribution. The LOGISTIC procedure, using the Statistical Analysis System (SAS) software package, will be used to estimate the logistic regression. The LOGISTIC procedure fits the logistic multiple regression to a single binary dependent variable by computing maximum likelihood estimates.[16]

A brief description follows of the method of nonlinear estimation used to predict the probability that a physician will choose to stay in the Navy. The factors believed to

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[15] Damodar N. Gujarati, *Basic Econometrics* (New York: McGaw-Hill, 1995), 554.

[16] Kathryn Kocher, *Selected SAS Documentation: Manpower, Personnel, and Training Analysis* (Naval Postgraduate School, 1996), 14.

influence the stay/leave decision of the individual physician are linked to a model that creates a prediction of the physician's choice and is written as: $P = E(Y=1 \mid Xi) = \alpha + Xi + \beta Xi + \varepsilon$

where P = the probability that a physician stays in the Navy

Y = 1 if the physician chooses to stay in the Navy

Y = 0 if the physician chooses to leave the Navy

X = a vector of independent variables that may influence the choice to leave or stay for the ith observation

α = a constant intercept term

β = a vector of parameter estimates

ε = independently distributed random variable with 0 mean

This model can be written to represent the cumulative logistic distribution:

$$Pi = E(Y = 1 \mid Xi) = \frac{1}{1 + e^{-(\alpha + \beta \chi i)}} \qquad (A)$$

or further as:

$$Pi = \frac{1}{1 + e^{-Zi}} \qquad (B)$$

where

$$Zi = \alpha + \beta \chi i$$

A decision to stay will be based on a variety of factors, so that some index Z exists for every physician. Z is a theoretical unmeasured continuous variable that represents the physician's attitude toward staying in the Navy. At some value of Z, a threshold is passed

and the physician decides to stay in the Navy. There is some Z* which represents a cutoff value that translates the unobservable index Z into a decision to leave or stay. Specifically:

Physician stays if $Z > Z^*$ and Physician leaves if $Z \leq Z^*$.[17]

It has been verified that when Zi ranges from $-\infty$ to $+\infty$, Pi ranges between 0 and 1 and that Pi is nonlinearly related to Zi. This means that OLS should not be used to estimate the parameters.[18]

The logit model is based on the cumulative logistic probability distribution function specified in equation (A) above. That equation can be further transformed to demonstrate how it is intrinsically linear.

If Pi is given by equation (B) above, then (1-Pi) is:

$$1-Pi = \frac{1}{1 + e^{Zi}}$$

or further,

$$\frac{Pi}{1 - Pi} = e^{Zi}$$

Now, Pi / (1- Pi) is simply the odds ratio in favor of staying in the Navy - the ratio of the probability that a physician will stay in the Navy to the probability that he or she will leave the Navy.[19]

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[17] Joyce S. McMahon, *A Retention Model for Navy Physicians*, (Center for Naval Analysis, June 1989), B-2.

[18] Kocher, p 14.

[19] Gujarati, 555.

Taking the natural log of the above equation yields,

$$Li = \log \frac{Pi}{1-Pi} = Zi = \alpha + \beta\chi i. \qquad (C)$$

Li is the log of the odds ratio and is linear in X and in the parameters. This is the logit model. Although the logit model is linear in X, the probabilities themselves are not, the probabilities do not increase linearly with X. The logit model assumes that the log-odds ratio is linearly related to Xi. The slope = dP/dX = β2 P (1 - P), and will vary because the rate of change in probability with respect to X involves not only β2 but also the level of probability from which the change is measured.[20] That is, the change in the probability associated with a change in one of the X variables will be dependent on the value of that variable and on values of other X variables. The logit model slope can be directly interpreted as the change in the log-odds ratio for a unit change in X, that is, it tells how the log-odds in favor of leaving the Navy change as say the pay variable increases by one unit of measurement ($000). The intercept term is the log-odds in favor of staying if an independent variable is zero and has little meaning.

Given certain values for the independent variables, the estimated probability of staying in the Navy, rather than the odds in favor of staying in the Navy, can be estimated. This is done using the estimates of α and β

$$P = \frac{e^{-"logit"}}{1+e^{-"logit"}}$$

where

[20] Ibid.

$$\text{“logit”} = Li = \alpha + \beta\chi i.^{21}$$

In order to get the α and β values for the logit, the maximum likelihood method is used.

1. Goodness of Fit

The Wald statistic is used to test the hypothesis that a parameter is equal to zero. This is a maximum likelihood chi-squared statistic, calculated by dividing the parameter estimate by its standard error and squaring the result.

2. Elasticity

The logit model coefficients can be converted to elasticities in order to interpret how much the probability of staying the Navy changes as the pay variable changes. The policy implications are that if the pay differential is reduced, on average, for a group of physicians, retention is expected to increase and the expected percentage retention increase can be described in terms of the elasticity. The elasticity of the probability of leaving with respect to an independent variable is given by $\beta Xi(1 - P)$, for continuous variables, or $dP/dX * X/P$, and = $\%\Delta$ in probability of leaving/ $\%\Delta$ in X . A positive sign on the coefficient means that an increase/decrease in a particular variable will increase/decrease the probability of staying, respectively. The magnitude of the increase/decrease is given by the elasticity. If the elasticity = .7 and the pay differential were reduced by 10 percent, the probability of staying would be expected to increase by 7 percent, resulting in a predicted increase in retention.

[21] Kocher, 14.

The specialty-specific elasticities will also be computed if the sample size permits running a regression for each specialty category.

3. Marginal Effects Analysis

The relative impact of each variable on retention can also be computed using marginal effects analysis. The differences in probability of staying for a "reference physician" within each specialty category are computed, and that difference reflects the magnitude of the effect. Marginal effects are computed by first, obtaining the β's from the logit regression and then defining the reference physician. The reference case is often evaluated at the mean value of the continuous variables. Second, using the reference physician's variable values obtain their predicted probability of staying. Next, change the value of a given variable (the pay variable) by one unit of measurement and hold the value of the other variables constant, then obtain a new predicted probability. The difference between the two predicted probabilities is the change in probability that $Y = 1$.

IV. DATA ANALYSIS AND INTERPRETATION

A. INTRODUCTION

This chapter discusses analytical results for the effect of the civilian-military pay differential and other demographic factors. The main analytical issue is the quantification of the role of the civilian-military pay differential on the retention of physicians. The first segment of this chapter provides an analysis of compensation profiles for Navy physician personnel from the Joint Uniform Military Pay System (JUMPS) database. This segment calculates civilian-military pay gaps for 22 physician specialties, where high managed care penetration has affected the civilian-military pay differentials throughout the country during health care reform (1992-1996).

Previous analysis from prior CNA studies revealed that Navy medicine had a growing retention problem among those completing their initial obligation among certain specialties. The second segment of this chapter updates the analysis of physician retention using 1992-1996 data. The analysis will determine the retention rates among unobligated physicians in a health care reform environment.

The third segment of this chapter provides results of the physician retention model described in Chapter III, linking various characteristics of fully trained specialists to the observed probability that they will leave the Navy. This model quantifies the effect of military-civilian pay differentials have on retention, while controlling for other factors likely to affect retention. This segment evaluates the sensitivity of retention to changes in the relative size of the military-civilian pay differential.

B. PAY DIFFERENTIAL

Previous studies have indicated significant gaps between civilian and military physician compensation. These studies have verified the presence of positive civilian-military pay gaps for physicians, and have documented high variations in pay across different civilian specialties and low variation in Navy pay. As mentioned in Chapter II,

regular military compensation for physicians consists of the following: base pay, basic allowances for subsistence (BAS), basic allowance for quarters (BAQ), and in some cases variable housing allowance (VHA).[1] In addition, physicians receive variable special pay (VSP), incentive special pay (ISP), additional special pay (ASP), board certified pay (BCP), and in some cases multi-year special pay (MSP).

In calculating the monetary compensation profiles, data was obtained for fully trained physicians from the JUMPS tape on active duty on all pays received by these physicians during each calendar year. For the years 1992-1996, the JUMPS pay data were merged with historical data for each physician from the DMDC Health Manpower Personnel Data System (HMPDS). Supplementary pay records for Medical Officer Retention Bonus/Multi-year Specialty Pay recipients from the Bureau of Medicine Information System (BUMIS) were also merged to enable accurate pay distributions to be calculated.[2] The pay data view a snapshot of personnel from 1992 through 1996. The pay reported includes all monetary pays.

There are a number of sources of information on the earnings of civilian physicians that could be used to measure the civilian income alternatives of Navy physicians. The three main organizations that collect information on civilian physicians' compensation were reviewed.

Comparisons for annual compensation were calculated for 22 specialties by pay grade. This study matches the Navy O-4 through O-6 pay grades with data from the Association of American Medical Colleges (AAMC) obtained for assistant professor, associate professor, and full professors. The AAMC data are based on faculty salaries plus supplemental income from outside sources. Table 8 shows the comparison of mean

[1] In January 1998, VHA and BAQ were combined to form the Basic Allowance for Housing (BAH). This study uses VHA and BAQ rates when calculating RMC.

[2] The Medical Officer Retention Bonus was replaced by the Multi-year Specialty Pay in 1992.

earnings for Navy physicians and their AAMC counterparts by experience level for 1996. Appendices B and C provide pay comparison summary data for Navy physicians by specialty for 1996. Table 8 shows that the pay gap tends to widen as physicians approach higher levels in each organization. There are a greater variety of earnings across specialties in the civilian sector than in the Navy. The mean income in the Navy in 1996 for an O-4 fully trained specialist ranged from $87,200 in Family Practice to $101,600 for Orthopedics and Radiology. In the civilian sector, the range for assistant professors (O-4 equivalent) using AAMC data ranged from $101,100 in Neurology to $226,900 in Orthopedic surgery. For O-6 physicians, the Navy had a range of mean income from $125,700 in Pathology to $153,800 in Orthopedics. In the civilian sector, the range for full professor (O-6 equivalent) ranged from $137,600 in Family Practice to $433,400 in Cardiovascular/thoracic surgery. The mean pay differential for all levels of experience (O-4, O-5, O-6) ranged from $5,800 for Neurology to $241,200 for Cardiovascular/thoracic surgeons.

Table 8. Comparison of Navy physician specialist pay to alternative civilian pay for 1996

	Median Income		Civ-Mil	Mean Income		Civ-Mil	Navy
	Navy	AAMC	difference	Navy	AAMC	difference	Inventory
Emergency Medicine							
O4	90,000	133,000	43,000	91,500	135,600	44,100	69
O5	124,700	149,000	24,300	120,000	151,300	31,300	27
O6	134,300	164,000	29,700	133,900	167,600	33,700	9
Anesthesiology							
O4	107,800	150,000	42,200	101,400	156,900	55,500	92
O5	128,900	184,000	55,100	128,600	191,700	63,100	40
O6	147,000	204,000	57,000	146,000	209,800	63,800	21
Dermatology							
O4	89,700	120,000	30,300	89,300	137,800	48,500	28
O5	111,500	164,000	52,500	114,000	187,400	73,400	14
O6	135,700	169,000	33,300	135,300	200,900	65,600	12
Family Practice							
O4	85,900	104,000	18,100	87,200	107,300	20,100	78
O5	115,000	120,000	5,000	114,700	123,200	8,500	95
O6	125,900	128,000	2,100	125,900	137,600	11,700	56

Neurology							
O4	95,100	94,000	-1,100	91,000	101,100	10,100	13
O5	118,700	121,000	2,300	119,100	124,900	5,800	10
O6	139,500	148,000	8,500	136,200	159,700	23,500	9
Obstetrics and Gynecology							
O4	102,900	147,000	44,100	101,900	156,400	54,500	61
O5	124,900	183,000	58,100	123,700	196,300	72,600	24
O6	149,900	200,000	50,100	147,300	218,100	70,800	15
Ophthalmology							
O4	105,400	138,000	32,600	99,700	156,900	57,200	32
O5	128,100	188,000	59,900	126,900	202,200	75,300	29
O6	145,600	195,000	49,400	147,300	220,700	73,400	16
Otolaryngology							
O4	92,300	164,000	71,700	91,300	188,300	97,000	49
O5	127,300	200,000	72,700	122,500	221,100	98,600	18
O6	148,600	223,000	74,400	148,100	247,600	99,500	8
Pathology							
O4	99,100	104,000	4,900	95,200	107,700	12,500	36
O5	118,700	132,000	13,300	118,300	133,700	15,400	38
O6	127,700	157,000	29,300	125,700	160,600	34,900	20
Pediatrics							
O4	89,200	97,000	7,800	88,100	103,100	15,000	29
O5	110,900	115,000	4,100	108,900	123,600	14,700	16
O6	126,000	138,000	12,000	126,200	146,900	20,700	25
Preventive Medicine							
O4	82,800	97,000	14,200	88,700	101,400	12,700	19
O5	114,600	104,000	-10,600	111,300	119,900	8,600	33
O6	127,200	139,000	11,800	126,600	150,800	24,200	27
Psychiatry							
O4	87,600	99,000	11,400	88,600	101,500	12,900	44
O5	115,000	120,000	5,000	111,900	122,700	10,800	32
O6	129,600	143,000	13,400	130,900	149,900	19,000	34
Radiology							
O4	107,100	156,000	48,900	101,600	158,400	56,800	94
O5	132,300	195,000	62,700	129,000	195,700	66,700	38
O6	142,600	212,000	69,400	143,900	212,300	68,400	17
General Surgery							
O4	102,200	155,000	52,800	100,600	165,900	65,300	92
O5	128,900	202,000	73,100	127,700	225,200	97,500	46
O6	144,900	227,000	82,100	147,500	241,500	94,000	30

Neurological Surgery							
O4	111,600	203,000	91,400	99,100	222,300	123,200	16
O5	ns	269,000	ns	ns	302,200	ns	3
O6	143,500	316,000	172,500	147,200	346,000	198,800	4
Orthopedic							
O4	112,800	198,000	85,200	101,600	226,900	125,300	88
O5	135,300	235,000	99,700	134,500	255,900	121,400	19
O6	156,600	244,000	87,400	153,800	274,800	121,000	24
Plastic Surgery							
O4	ns	168,000	ns	ns	196,600	ns	2
O5	145,400	226,000	80,600	140,300	259,500	119,200	6
O6	ns	263,000	ns	ns	287,500	ns	1
Cardiovascular-Thoracic Surgery							
O4	ns	200,000	ns	ns	222,300	ns	1
O5	135,100	293,000	157,900	132,800	374,000	241,200	7
O6	ns	362,000	ns	ns	433,400	ns	2
Urology							
O4	93,500	147,000	53,500	92,000	150,900	58,900	32
O5	130,100	211,000	80,900	125,400	220,900	95,500	11
O6	152,100	213,000	60,900	150,000	242,400	92,400	8
Gastroenterology							
O4	99,200	110,000	10,800	99,200	114,600	15,400	6
O5	121,800	156,000	34,200	122,800	158,700	35,900	11
O6	136,800	164,000	27,200	137,000	169,100	32,100	5
Cardiology							
O4	101,100	137,000	35,900	101,100	150,400	49,300	21
O5	119,400	165,000	45,600	119,100	177,000	57,900	4
O6	137,700	186,000	48,300	134,500	203,000	68,500	4
Internal Medicine							
O4	85,000	103,000	18,000	88,800	112,300	23,500	41
O5	121,200	127,000	5,800	116,500	138,200	21,700	18
O6	130,000	155,000	25,000	128,800	165,800	37,000	25

Note: Figures were rounded to the nearest 100.
a. ns: Not shown due to small number of personnel in cell.
b. Mean and median may be volatile because of small population size.

Figure 10 and 11 graphically illustrate the difference in earnings over time between the civilian sector (AAMC data) and the Navy. The earnings levels for the hospital based, office based, and primary care categories for the Navy in figure 10 are

grouped much closer together than the civilian sector in figure 11. For the civilian sector, there is a larger variation between the procedural specialty earnings and the other three categories. Additionally, the private sector experienced a greater variation between primary care earnings and hospital and office based specialties.

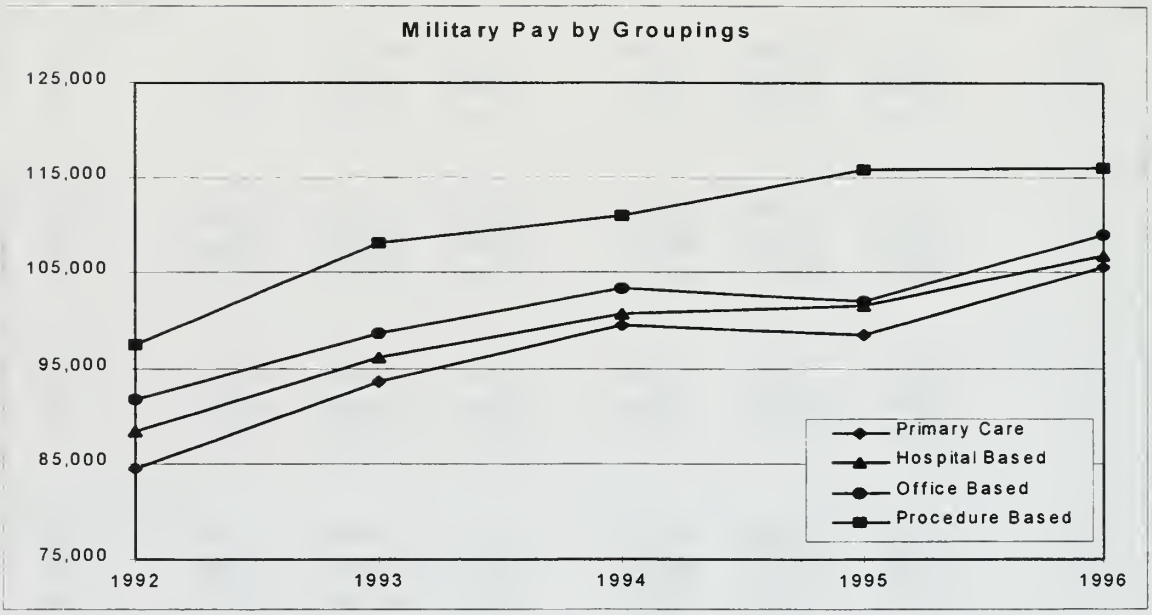


Figure 10. Military pay by specialty grouping

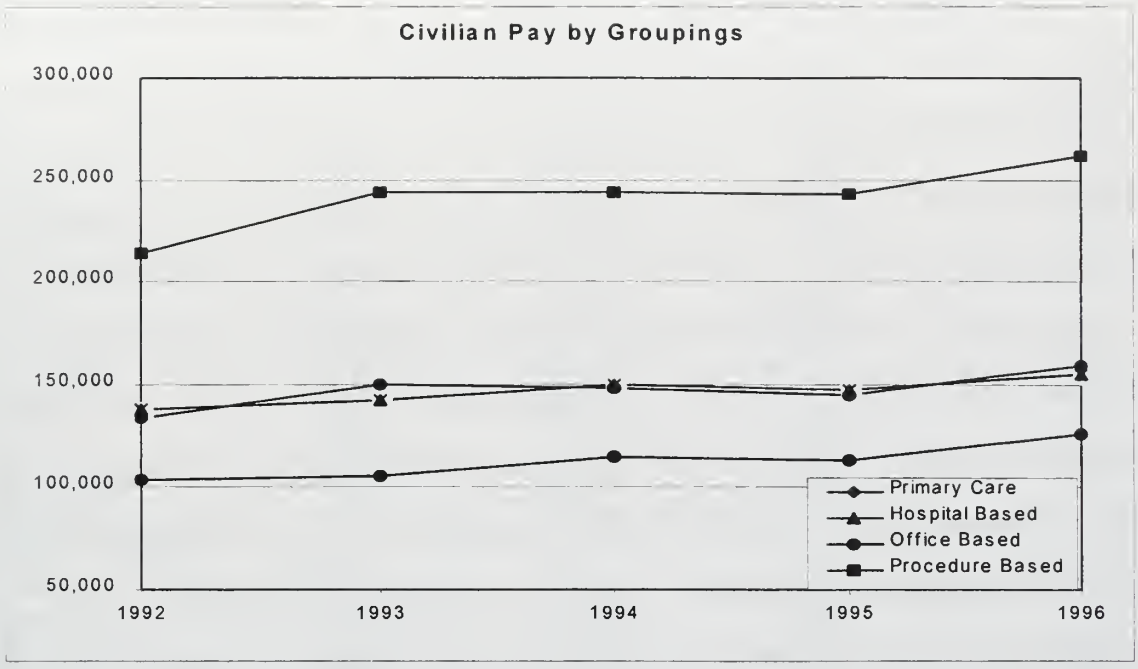


Figure 11 civilian pay by specialty grouping

Table 9 illustrates the change in pay differentials and pay ratios by specialty between 1984 and 1996.[3] The physician specialties are listed in order by the following four categories: **primary care, hospital based, office based, and procedural based**. Figure 10 and 11 show that the group arrangement is consistent with low paying specialties (family practice, pediatrics, and general medicine) to high paying specialties (specialty surgery).

Table 9 reveals the high degree of income dispersion among specialties in the civilian sector compared to the Navy. The pay differential is particularly acute in high paying specialties in the civilian sector. The pay ratios for all specialties fell over the 12-year period. Pay ratios are listed, because they control for inflation. The aggregate pay differential increased from $25,200 to $55,800, but the pay ratio fell from .79 to .66.

[3] The pay ratio is defined as the military earnings to civilian earnings. A ratio of .94 for a Neurologist means that on average a navy Neurologist earns 94 percent of his civilian counterpart in that particular specialty at a point in time. It is calculated by dividing military earnings by civilian earnings.

Neurologists show the smallest widening of the pay ratio between the Navy and civilian sector from 1984 to 1996, whereas neurological surgeons have experienced the greatest decrease in the pay ratio from 1984 to 1996. The pay ratio for Neurology only slipped from .94 to .89 over twelve years. However, the pay ratio for neurological surgeons fell sharply from .71 to .39 over the 12-year period. For the primary care category the pay ratios fell from 1984 through 1996. Family practice specialists pay ratio declined from .97 to .87. The pay ratio for pediatrics fell from 1.10 to .85, while general medicine fell from .97 to .79. In 1984, Navy pediatricians were paid $6,200 more than their civilian counterparts. Table 9 displays comparisons of Navy and alternative civilian pays for unobligated specialists in 1984 and 1996 using AAMC survey data. As previously stated, the emphasis in primary care and managed care penetration in the private sector has had an influence on the declining pay ratio for family practice and pediatric specialists since 1984. Earnings data for 1984 in Emergency and Preventive Medicine were not provided in the CNA study.

Table 10 illustrates the change in pay differentials and pay ratios by specialty from 1992 and 1996. The physician specialties are listed in order grouped by the following four categories: primary care, hospital based, office based, and procedural based. Neurologists show the smallest pay gap between the Navy and civilian sector for 1996 ($13,600), whereas Cardiovascular/thoracic surgeons have the largest pay differential ($232,200). The pay differential for Neurologists has been decreasing for the last four years, from $22,200 to $13,600. From 1992-1996 the pay ratio for neurologists improved from .79 to .89. A summary of AAMC and Hay Group physician compensation data can be found in Appendix D.

Table 9. Comparison of Navy and civilian pay (AAMC data) unobligated fully trained specialists, FY 1984 and FY 1996

Specialty	Average Physician's Pay ($) Navy	Civilian (AAMC)	Differential	Ratio
1984				
Family Practice	65,600	68,000	2,400	.97
Pediatrics	66,200	60,000	(-6,200)	1.10
Internal Medicine	67,900	69,900	2,000	.97
Emergency Medicine	ns	ns	ns	ns
Radiology	68,500	93,900	25,400	.74
Anesthesiology	74,500	101,300	26,800	.73
Pathology	69,100	71,300	2,200	.97
Dermatology	72,800	70,700	(-2,100)	1.03
Neurology	66,600	71,900	5,200	.93
Ob/Gyn	69,600	89,900	20,300	.78
Ophthalmology	70,600	96,200	25,600	.73
Otolaryngology	77,900	100,500	22,700	.78
Preventive Medicine	ns	ns	ns	ns
Psychiatry	69,500	72,900	3,400	.95
Urology	75,900	94,200	18,300	.81
Gastroenterology	66,500	75,900	9,500	.88
Cardiology	70,800	82,400	11,500	.86
General Surgery	81,000	103,300	22,300	.78
Neurological Surgery	80,200	113,600	33,300	.71
Orthopedic	79,600	114,400	34,800	.70
Plastic Surgery	84,300	122,300	38,000	.69
Cardio/Thoracic Surgery	90,600	138,700	48,100	.65
1996				
Family Practice	106,000	121,300	15,300	.87
Pediatrics	104,800	123,400	18,600	.85
Internal Medicine	105,800	133,800	28,000	.79
Emergency Medicine	97,200	142,400	45,200	.68
Radiology	108,500	174,000	65,500	.62
Anesthesiology	112,500	173,300	60,800	.65
Pathology	109,100	129,500	20,400	.84
Dermatology	101,900	164,700	62,800	.62
Neurology	111,400	125,000	13,600	.89
Ob/Gyn	111,000	175,200	64,200	.63
Ophthalmology	115,800	187,200	71,400	.62
Otolaryngology	103,500	202,500	99,000	.51
Preventive Medicine	110,200	126,000	15,800	.87
Psychiatry	106,700	122,600	15,900	.87
Urology	101,900	180,400	78,500	.57
Gastroenterology	119,600	149,000	29,400	.80
Cardiology	108,200	161,300	53,100	.67
General Surgery	110,400	195,600	85,200	.56
Neurological Surgery	98,000	254,200	156,200	.39
Orthopedic	111,400	239,900	128,500	.46
Plastic Surgery	121,900	248,600	126,700	.49
Cardio/Thoracic Surgery	138,500	370,700	232,200	.37

ns: not shown; 1989 CNA study did not analyze that specialty for 1984.

For the **primary care** category in Table 10 there were mixed results in the trend in pay ratios between 1992 and 1996. Family practice specialists' pay ratio declined from .89 to .87. The pay ratio for pediatrics rose from .83 to .85, while general medicine rose from .74 to .79. The pay ratio for family practice specialists from 1984 to 1996 fell from .96 to .87. The emphasis in primary care and managed care penetration in the private sector may have been one factor explaining the declining pay ratio for family practice and pediatric specialists since 1992.

Changes in pay ratios were found among **hospital based** specialists of Emergency Medicine, Radiology, Anesthesiology, and Pathology. Radiologists and Pathologists had only a minimal increase in pay ratios. The pay ratio for Anesthesia specialists rose from .57 to .68, as the pay differential closed from $68,300 to $60,800. This supports a previous observation in chapter II regarding the modest growth of seven percent in private sector Anesthesia specialist earnings over the past four years. Emergency Medicine specialist's pay ratio rose from .60 to .68. The demand for emergency medicine physicians in the private sector has declined due to strict managed care rules regarding emergency room visits. With the exception of life threatening injuries, loss of limb, or eye sight, many managed care patients are restricted from urgent care and emergency room visits without first contacting either their primary care physician or triage nurse.

Six of the ten **office-based** specialists experienced decreasing pay ratios (and increasing pay differentials), while Gastroenterology and Neurology experienced pay ratio increases. Neurology experienced an increase from .79 to .89. Cardiology experienced a declining ratio .72 to .67 over the four-year span. Preventive Medicine also experienced a declining from .96 to .87. Four of the five **procedural** specialty pay ratios remained stable over the four-year period, despite increases in the pay differential. Neurological surgery experienced a decrease in pay ratio (.44 to .39). Orthopedic surgery had minimal improvement in the pay ratio (.45 to .46).

Table 10. Comparison of Navy and civilian pay (AAMC data), unobligated fully trained specialists, FY 1992 and FY 1996

Specialty	Average Physician's Pay ($) Navy	Civilian (AAMC)	Differential	Ratio
1992				
Family Practice	85,400	95,700	10,300	.89
Pediatrics	85,400	102,800	17,400	.83
Internal Medicine	82,800	111,900	29,100	.74
Emergency Medicine	75,800	127,200	51,400	.60
Radiology	94,000	154,100	60,100	.61
Anesthesiology	91,800	160,100	68,300	.57
Pathology	91,900	110,300	18,400	.83
Dermatology	85,500	140,100	54,600	.61
Neurology	85,400	107,600	22,200	.79
Ob/Gyn	100,500	152,100	51,600	.66
Ophthalmology	97,900	158,900	61,000	.62
Otolaryngology	87,400	163,000	75,600	.54
Preventive Medicine	94,400	97,900	3,500	.96
Psychiatry	90,500	107,700	17,200	.84
Urology	93,300	165,900	72,900	.56
Gastroenterology	88,800	111,900	23,100	.79
Cardiology	93,300	130,200	36,900	.72
General Surgery	94,500	170,100	75,600	.56
Neurological Surgery	89,600	205,200	115,600	.44
Orthopedic	92,400	205,700	113,300	.45
Plastic Surgery	107,300	212,600	105,300	.50
Cardio/Thoracic Surgery	103,100	277,100	174,000	.37
1996				
Family Practice	106,000	121,300	15,300	.87
Pediatrics	104,800	123,400	18,600	.85
Internal Medicine	105,800	133,800	28,000	.79
Emergency Medicine	97,200	142,400	45,200	.68
Radiology	108,500	174,000	65,500	.62
Anesthesiology	112,500	173,300	60,800	.65
Pathology	109,100	129,500	20,400	.84
Dermatology	101,900	164,700	62,800	.62
Neurology	111,400	125,000	13,600	.89
Ob/Gyn	111,000	175,200	64,200	.63
Ophthalmology	115,800	187,200	71,400	.62
Otolaryngology	103,500	202,500	99,000	.51
Preventive Medicine	110,200	126,000	15,800	.87
Psychiatry	106,700	122,600	15,900	.87
Urology	101,900	180,400	78,500	.57
Gastroenterology	119,600	149,000	29,400	.80
Cardiology	108,200	161,300	53,100	.67
General Surgery	110,400	195,600	85,200	.56
Neurological Surgery	98,000	254,200	156,200	.39
Orthopedic	111,400	239,900	128,500	.46
Plastic Surgery	121,900	248,600	126,700	.49
Cardio/Thoracic Surgery	138,500	370,700	232,200	.37

In Table 11, the Hay survey data produces different results than the AAMC data. Both the aggregate pay differentials and the pay gap for the Hay data are much wider than the AAMC data. The pay gap difference is substantial as well. The AAMC aggregate pay gap in 1996 is .66, while it is .58 using the Hay group data. The Hay data shows the smallest pay gap is found in Family Practice ($19,200), whereas Neuro-surgery experienced the largest gap.

The Hay data illustrates the following results for each specialty grouping. **Primary care** had results that were very consistent with AAMC data. Family Practice and Pediatrics experienced a stable pay ratio over the four-year period, while Internal Medicine showed improvement from .57 to .63. From 1992 and 1996 civilian Internal Medicine specialist earnings growth (24 percent) were outpaced by Navy earnings growth (28 percent), resulting in an improved pay ratio.

The results for two of the four **hospital-based** (Emergency Medicine and Pathology) specialties were consistent with the AAMC data. The results for Anesthesia and Radiology differed. Using AAMC data the pay ratio for Anesthesiologists increased from .57 to .65, consistent with civilian market trends of reduced earnings growth. However, the Hay data showed a decrease of the pay ratio from .52 to .50. Radiology showed a decreasing pay ratio using Hay data, but an increase using AAMC data.

Five of the ten **office-based** specialties saw a narrowing of pay ratios, while other office specialties were stable. Urology experienced a modest widening. For **procedural** specialties, Cardiovascular/thoracic and orthopedics saw a modest improvement, while Neurological and plastic surgery experienced decreasing pay ratios from 1992-1996.

Table 11. Comparison of Navy and alternative civilian pay (Hay Group data) for unobligated fully trained specialists, FY 1992 and FY 1996

Specialty	Average Physician's Pay ($) Navy	Civilian (Hay Survey)	Differential	Ratio
1992				
Family Practice	85,400	104,600	19,200	.82
Pediatrics	85,400	108,400	23,000	.79
Internal Medicine	82,800	112,800	30,000	.57
Emergency Medicine	75,500	141,100	65,300	.54
Radiology	94,000	183,800	89,800	.51
Anesthesiology	91,800	176,300	84,500	.52
Pathology	91,900	153,300	61,600	.60
Dermatology	85,500	149,900	64,400	.57
Neurology	85,400	144,400	59,000	.59
Ob/Gyn	100,500	179,200	78,700	.56
Ophthalmology	97,900	173,600	75,700	.56
Otolaryngology	87,400	177,600	90,200	.49
Preventive Medicine	94,400	139,100	44,700	.68
Psychiatry	90,500	129,400	38,900	.70
Urology	93,000	177,200	84,200	.52
Gastroenterology	88,800	145,400b	56,600	.61
Cardiology	93,300	145,400b	52,100	.64
General Surgery	94,500	169,300	74,800	.56
Neurological Surgery	89,600	241,900a	152,300	.37
Orthopedic	92,400	241,900	149,500	.38
Plastic Surgery	107,300	241,900a	134,600	.44
Cardio/Thoracic Surgery	103,100	241,900a	138,800	.43
1996				
Family Practice	106,000	128,400	22,400	.83
Pediatrics	104,800	133,200	28,400	.79
Internal Medicine	105,800	140,600	34,800	.63
Emergency Medicine	97,200	184,200	87,000	.53
Radiology	108,500	227,700	119,200	.48
Anesthesiology	112,500	222,800	110,300	.50
Pathology	109,100	180,400	71,300	.60
Dermatology	101,900	177,800	75,900	.57
Neurology	111,400	162,400	51,000	.69
Ob/Gyn	111,000	203,000	92,000	.55
Ophthalmology	115,800	196,300	80,500	.59
Otolaryngology	103,500	210,900	107,400	.49
Preventive Medicine	110,200	146,200	36,000	.75
Psychiatry	106,700	148,900	42,200	.72
Urology	101,900	208,100	106,200	.49
Gastroenterology	119,600	166,800b	47,200	.72
Cardiology	108,200	166,800b	58,600	.65
General Surgery	110,400	195,000	84,600	.57
Neurological Surgery	98,000	298,800a	200,800	.33
Orthopedic	111,400	271,100	159,700	.41
Plastic Surgery	121,900	298,800a	176,900	.41
Cardio/Thoracic Surgery	138,500	298,800a	160,300	.46

a/b: Hay data grouped three surgical specialties together and two medicine specialties together.

The thesis found an inconsistency in the Hay data for Anesthesia earnings. In a 1995 article from *Hospitals and Health Networks*, the Hay Group published Anesthesia earnings figures, which saw an 8 percent growth from 1992-1994(stated in chapter II). The Hay Group data provided to DoD Health Affairs revealed a 19 percent growth in Anesthesia earnings (1992-1996). The Hay Group earnings data found in the 1995 article are more consistent with current private sector trends than the Hay Group data provided to DoD Health Affairs. Anesthesia earnings reviewed by Health Affairs may be over-estimated, resulting in an over payment of specialty pays to Anesthesia specialists.

Figure 12 presents military and civilian pay over time using mean earnings between Pediatricians (primary care) and Cardio/thoracic surgeons (procedural). In 1996 the pay differential for Pediatricians was small ($18,600), relative to Cardio/thoracic surgeons ($232,000). This suggests the reasoning why DoD pays higher specialty bonuses for procedural specialists.

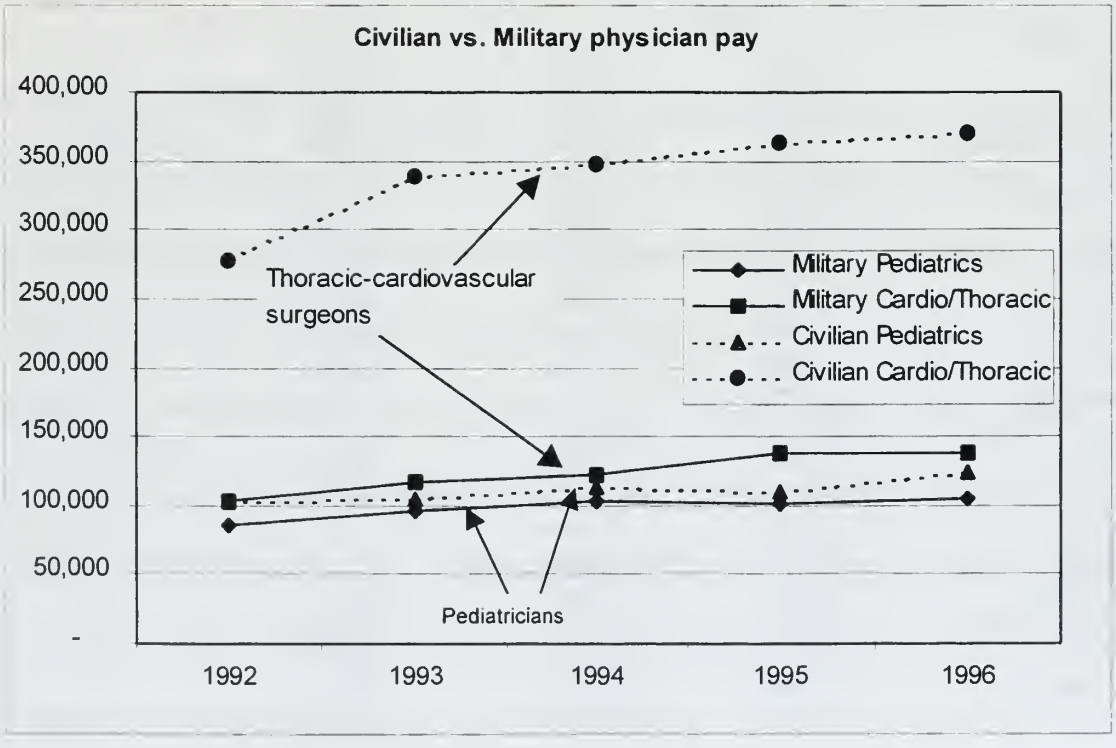


Figure 12. Civilian vs. Military physician pay differences, fiscal years 1992 - 1996

C. PHYSICIAN RETENTION

Compensation schedules affect fully trained physicians in a number of ways: the attractiveness of direct accession physicians, physician enrollment in a residency program, and retention decisions for fully trained specialists. Retention problems usually develop among physicians who have the best civilian alternative pay, all other factors constant. The analysis of physician retention uses pooled cross-sectional data from of the Health Manpower Personnel Data System (HMPDS) for 1992-1996 provided by DMDC. All retention figures are calculated for the actual number of specialists onboard during the specified time period.

1. Aggregate Continuation and Retention Rates

Yearly continuation rates for physician specialists have been consistent over the past five years. The yearly continuation rate measures the percentage of physicians (both obligated and unobligated) on active duty at the beginning of the fiscal year who are still on active duty at the end of the year. For example, the aggregate continuation rate is measured as follows:

$$C92 = \frac{\text{number on active duty at the beginning of FY92 who remained on active duty as of the beginning of FY93}}{\text{number of active duty at the beginning of FY92}}$$

Depending on the accession source Navy physicians can incur up to eight years of active duty service. Unlike continuation rates, retention rates distinguish between voluntary and involuntary continuation by focusing on unobligated physicians. The retention rate is calculated as follows:

$$R92 = \frac{\text{number on active duty at the beginning of FY 1992 who are unobligated or are due off an obligation during FY 1992 who remained on active duty as of the beginning of FY1993.}}{\text{number on active duty at the beginning of FY 1992 who are unobligated or are due off an obligation during FY 1992}}$$

Tables 12 and 13 provide aggregate continuation and retention rates for fully trained Navy specialists for the years 1984-1988 and 1992-1996 respectively. The retention rates listed in Table 13 are lower in the 1990's than during the 1980's. After controlling for involuntary losses and erroneous obligation data, the sample size used in this thesis (Table 13) was lower than in previous CNA studies (Table 12).

Table 12. Specialist continuation and retention rates, FY 1984-1988 (population size in parenthesis)

Fiscal year	Continuation rate (Obligated & unobligated)	Retention (Unobligated)
1984	88 (3,847)	76 (1,500)
1985	89 (3,930)	76 (1,573)
1986	89 (3,954)	76 (1,583)
1987	88 (3,947)	74 (1,569)
1988	88 (3,896)	72 (1,463)

Source: Derived from CNA Study "Retention of Navy Physicians 1984-1988."

Table 13. Specialist continuation and retention rates, FY 1992-1996 (population size in parenthesis)

Fiscal year	Continuation rate (Obligated & unobligated)	Retention (Unobligated)
1992	86 (2,214)	63 (691)
1993	83 (2,132)	60 (690)
1994	82 (2,092)	51 (669)
1995	81 (1,947)	53 (573)
1996	87 (1,854)	63 (569)

Source: Derived from data provided by the Defense Manpower Data Center (DMDC), Monterey CA.

Table 14 illustrates retention rates by specialty at the end of an obligation. The retention rates are listed by specialty groupings. The retention rates for the specialties tend to be erratic over the four-year period. Therefore, no real trends can be determined by specialty from this table.

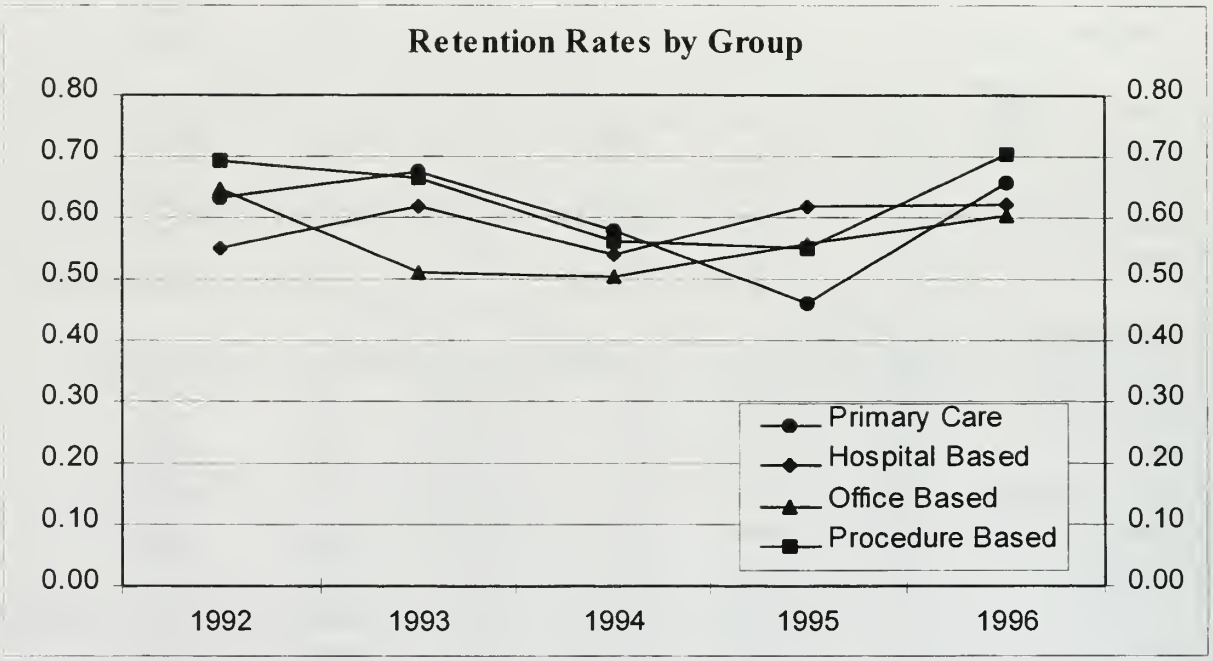
Table 14. Retention by specialty at the end of an obligation

	1992	1993	1994	1995	1996	Average
Primary Care						
Family Practice	0.63	0.54	0.60	0.61	0.65	0.63
Pediatrics	0.74	0.73	0.73	0.27	0.66	0.65
Medicine	0.52	0.76	0.41	0.50	0.67	0.63
Hospital Based						
Emergency Med	0.55	0.50	0.52	0.68	0.65	0.60
Radiology	0.50	0.49	0.55	0.47	0.42	0.52
Anesthesiology	0.53	0.65	0.45	0.62	0.63	0.61
Pathology	0.62	0.84	0.63	0.70	0.79	0.73
Office Based						
Dermatology	0.69	0.63	0.37	0.35	0.60	0.51
Neurology	0.78	0.75	0.57	0.50	0.67	0.65
Ob/Gyn	0.43	0.23	0.41	0.42	0.44	0.42
Ophthalmology	0.60	0.62	0.75	0.63	0.77	0.68
Otolaryngology	0.67	0.48	0.38	0.52	0.90	0.63
Prev Med	0.75	0.64	0.77	0.75	0.55	0.72
Psychiatry	0.69	0.60	0.73	0.55	0.68	0.66
Urology	0.65	0.55	0.44	0.88	0.29	0.60
Gastroenterology	0.73	0.46	0.46	0.73	0.67	0.61
Cardiology	0.50	0.18	0.17	0.25	0.50	0.33
Procedure Based						
General Surg	0.73	0.64	0.46	0.49	0.64	0.63
Neuro-surgery	0.43[a]	0.20[a]	0.50[a]	0.25[a]	0.20[a]	0.32[a]
Orthopedic	0.62	0.47	0.35	0.41	0.67	0.56
Plastic	1.00[a]	1.00[a]	0.50[a]	0.60[a]	1.00[a]	0.79[a]
Cardio/Thoracic	-	1.00[a]	1.00[a]	1.00[a]	1.00[a]	1.00[a]

a: Rates may be significantly affected by the behavior of a few physicians due to small population size.
Source: Derived from data provided by DMDC, Monterey, CA.

Figure 13 shows trends in physician retention from 1992-1996 by specialty grouping. This gives a clearer picture of physician specialty retention over time than Table 14. Retention for all of the specialty groupings decreased from 1992 through 1994, leveled out, and increased in 1996. Primary care specialists experienced the most dramatic shift in retention as it fell sharply from 68 percent to 46 percent between 1993-

1995. Primary care retention recovered to 66 percent by 1996. After a significant decrease from 1992-1995, procedural-based physician retention rebounded in 1996.



	1992	1993	1994	1995	1996	Total
Primary Care	0.63	0.68	0.58	0.46	0.66	0.64
Hospital Based	0.55	0.62	0.54	0.62	0.62	0.61
Office Based	0.65	0.51	0.50	0.56	0.61	0.59
Procedure Based	0.70	0.66	0.56	0.55	0.70	0.60
Total	0.63	0.62	0.55	0.55	0.65	0.61

Figure 13. Retention rates for physicians by specialty grouping from 1992-1996.
Source: Derived from data provided by DMDC, Monterey, CA.

2. Specialty Continuation and Retention Rates

Table 15 compares average historical continuation and retention rates for 1984-1987 with the corresponding rates from fiscal year 1992-1996 for 21 specialties. Gastroenterology has been left out due to ambiguity in how CNA defines the Internal Medicine–other category.

Table 15. Specialty continuation and retention rates for fully trained specialists (includes executive medicine) (population size in parentheses)

	Continuation		Retention	
	Average FY1984-1987	Average FY 1992-1996	Average FY1984-1987	Average FY 1992-1996
Emergency Med.	84 (70)	89 (471)	80 (41)	60 (112)
Anesthesiology	77 (417)	82 (846)	61 (217)	61 (322)
Dermatology	83 (162)	85 (322)	80 (122)	51 (84)
Family Practice	81 (853)	86 (1186)	73 (515)	63 (330)
Neurology	85 (97)	89 (161)	77 (65)	65 (40)
Obstetrics/Gyn	77 (488)	79 (479)	65 (286)	42 (144)
Ophthalmology	83 (238)	90 (382)	77 (168)	68 (91)
Otolaryngology	76 (187)	86 (410)	66 (122)	63 (100)
Pathology	85 (329)	89 (498)	81 (238)	73 (151)
Pediatrics	87 (818)	77 (703)	83 (624)	65 (307)
Preventive Med.	87 (127)	81 (488)	84 (92)	72 (103)
Psychiatry	85 (403)	87 (601)	81 (312)	66 (177)
Radiology	77 (441)	86 (746)	64 (255)	52 (180)
General Surgery	80 (518)	84 (898)	75 (331)	63 (293)
Neurological Surg	68 (37)	82 (111)	45 (20)	32 (25)
Orthopedic	82 (337)	82 (711)	71 (194)	56 (217)
Plastic Surgery	82 (34)	89 (56)	76 (17)	79 (14)
Cardio/thoracic Surg	78 (45)	86 (65)	68 (25)	80 (6)[a]
Urology	80 (160)	84 (273)	75 (107)	60 (89)
Cardiology	81 (133)	81 (181)	74 (84)	33 (46)
Internal Medicine	85 (572)	74 (505)	78 (362)	63 (176)
All fully trained	82 (6,466)	84 (10,093)	75 (4,197)	61 (3,007)

a: Rates may be significantly affected by the behavior of a few physicians due to small population size.
Source: Data for 1984-1987 were obtained from the 1989 CNA study "Retention of Navy Physicians, FY 1984-1987" by Amy Graham and Laurie May. Results for 1992-1996 were derived from data provided by DMDC, Monterey, CA.

For FY 1992-1996 16 of the 21 specialties experienced a continuation rate that was higher than the FY 1984-1987 period. In 18 of the 21 specialties, the retention rate for unobligated specialists fell below the average for 1984-1987. This would indicate that a large number of physicians on active duty from 1992-1996 were obligated. The high number of obligated physicians from year to year helps maintain a high continuation rate. However, retention rates have fallen below the historical average. Pediatrics, Internal

Medicine, and Preventive Medicine experienced reduced continuation rates compared to 1984-1987. Two of these three are primary care specialties and may have been affected by a combination of shorter obligation periods and an increased opportunity to practice medicine in the private sector. The largest percentage point differences between current and historical retention rates occurred in Cardiology, Emergency Medicine, and Dermatology. Anesthesiology, Plastic surgery, and Cardiovascular/thoracic surgery had increasing retention rates in the 1990's, indicating that decreased civilian earnings growth may have had an influence on retention. The grass may not have been greener in the civilian sector as in previous years (1980's).

3. Authorizations by Specialty

Relative to authorizations, a few specialties have an acute manpower shortage. Navy physician billet authorizations reflect short-term inventory goals. Authorized billets are funded by Congress and generally reflect current manpower needs. Table 16 examines 22 specialties and displays manning levels for FY1988 from a prior CNA retention study.[4] There were 15 of 22 specialties that were manned below authorization, and 13 specialties were manned at less than 90 percent. After reviewing FY 1991 inventory to authorization, Table 16 indicates that 12 specialties were manned below authorization. Between FY 1988 and 1991, the inventory shortfall had increased in Emergency Medicine, Obstetrics/Gynecology, General Surgery, and Orthopedic Surgery. The increased shortfall in Emergency Medicine physicians is due to an increase in authorization. This increase in authorization may be a reflection of policy change in the practice of contracting Emergency Room physicians.

[4] Amy Graham and Laurie May, "Retention of Navy Physicians, FY 1984-1987," CNA 1989.

Table 16. Inventory and authorization levels of Navy specialists[a] for 1988/1991

Specialty	FY 1988 inventory	FY 1988 authorization	FY 1988 inventory over/under	FY 1991 inventory[b]	FY 1991 authorization	FY 1991 inventory over/under
Family Practice	205	240	-35	256	242	14
Pediatrics	198	158	40	143	153	10
Internal Medicine	158	114	44	198	112	86
Emergency Medicine	37	39	-2	43	60	-23
Radiology	86	110	-24	91	110	-19
Anesthesiology	122	139	-17	159	159	0
Pathology	80	91	-11	81	92	-11
Dermatology	40	35	5	31	34	-3
Neurology	31	28	3	25	28	-3
Obstetrics/Gynecology	110	134	-24	85	134	-49
Ophthalmology	58	46	12	44	49	-5
Otolaryngology	45	52	-7	50	56	6
Preventive Medicine	44	48	-4	68	52	16
Psychiatry	92	112	-20	100	115	-15
Urology	36	39	-3	40	40	0
General Surgery	135	161	-26	159	204	-45
Gastroenterology	--	--	--	--	--	--
Cardiology	22	27	-5	22	27	-5
Neurological Surgery	14	16	-2	16	20	-4
Orthopedic	98	109	-11	97	126	-29
Plastic Surgery	11	8	3	11	8	3
Cardio/thoracic Surg	9	18	-9	--	19	--
Total	1,631	1,724	-93	1,719	1,840	-121

[a] Authorization levels were obtained from: Amy E. Graham and Laurie J. May, *Retention of Navy Physicians, FY 1984-1988*, CNA 1989.
[b] Inventory data were obtained from LT Dave Brower, MSC, USN; Medical Corps Personnel Plans (Med-521).

Using data provided by the Bureau of Medicine, Table 17 examines 22 specialties, and displays manning levels for 1992 and 1996. In 1996 there were 11 of 22 specialties manned below authorization, and 6 of the 22 specialties are manned below the 90 percent authorization level. The gap between FY 1996 inventory and authorizations for Emergency Medicine, Pathology, and Obstetrics/Gynecology, Ophthalmology, Psychiatry, and General Surgery has improved (narrowed) substantially since FY 1988.

In FY 1992 and 1996, Family Practice has undergone a growing shortfall between authorizations and inventory. This is related to a large increase in authorization of 38 between 1991(242) and 1992 (280). Authorizations also increased by 34 between 1992 (280) and 1996 (314). Inventory for Internal Medicine between 1992 and 1996 increased from 194 to 245 (26 percent), while authorizations for this period only increased from 195 to 202 (4 percent). This caused an inventory overage of 43 Internal Medicine specialists. In response to lessons learned from Operation Desert Storm, the Navy increased its emphasis on primary care by increasing the number of authorizations for Family Practice physicians (1992 and 1996) and Internal Medicine specialists (1992). A combination of the increased authorizations due to policy change and an increased opportunity for Family Practice in the private sector may have contributed to this shortage.

Table 17. Inventory and authorization levels of Navy specialists[a] for 1992/1996

Specialty	FY 1992 inventory	FY 1992 authorization	FY 1992 inventory over/under	FY 1996 inventory	FY 1996 authorization	FY 1996 inventory over/under
Family Practice	245	280	-35	256	314	-58
Pediatrics	142	139	3	152	138	14
Internal Medicine	194	195	-1	245	202	43
Emergency Medicine	55	74	-19	80	70	10
Radiology	92	102	-10	86	94	-8
Anesthesiology	173	152	21	143	134	9
Pathology	75	76	-1	89	82	7
Dermatology	44	41	3	42	35	7
Neurology	21	29	-8	32	29	3
Obstetrics/Gynecology	75	120	-45	94	107	-13
Ophthalmology	43	41	2	64	47	17
Otolaryngology	50	53	-3	46	48	-2
Preventive Medicine	66	51	15	63	58	5
Psychiatry	123	114	9	97	93	4
Urology	38	33	5	39	30	9
Gastroenterology	28	29	-1	22	23	-1
Cardiology	29	27	2	16	30	-14
General Surgery	169	164	5	121	138	-17
Neurological Surgery	15	19	-4	14	16	-2
Orthopedic	99	116	-17	81	101	-20
Plastic Surgery	10	8	2	8	8	0
Cardio/thoracic Surg	14	25	-11	9	23	-14
Total	1,800	1,861	-61	1,799	1820	-21

a. Inventory and Authorization levels were obtained from LT Dave Brower, MSC, USN; Medical Corps Personnel Plans (Med-521).

D. PHYSICIAN RETENTION MODEL RESULTS

The logistic regression model used focuses on the influence of the civilian-military pay differential on the decision to leave the Navy. The model predicts the probability that a physician will stay in the Navy, given the values of the independent variables described in Table 18.

Table 18. Definitions of independent variables

Variable	Definition
Paydif	Pay differential between the civilian alternative earnings and Navy earnings for a particular fiscal year (= civilian pay – military pay).
Female	= 1 if female
Married[a]	= 1 if married
Single	= 1 if single
DIRECT	= 1 if Direct accession
USUHS	= 1 if accession via uniformed school health sciences medical school.
DAFHPSP	= 1 if accession via deferred scholarship status.
AFHPSP[a]	= 1 if accession via non-deferred scholarship.
Other	= 1 if procurement is other than those listed above.
LCDR[a]	= 1 if O-4.
CDR	= 1 if O-5.
CAPT	= 1 if O-6.
Minsta	= 1 if non-white.
YOS1[a]	= 1 if <10 years of creditable service.
YOS2	= 1 if ≥10 < 15 years of creditable service.

YOS3	= 1 if ≥ 15 < 20 years of creditable service.
YOS4	= 1 if ≥ 20 years of creditable service.
FamPrac[a]	= 1 if Family Practice physician.

a: Omitted category (reference group)

Table 19 presents the results of the logit model using AAMC data with fixed effects. The use of fixed effects for each physician specialty isolates and controls for the effect of each of the retention differences across specialties. The results indicate that the larger the pay differential between the military and civilian sector, the lower the probability that a physician will stay in the Navy. The reference case is defined as the following: a married, white, male, non-deferred scholarship entrant, LCDR Family Practice physician with ten or less years of service. It was found that married physicians are associated with a lower probability of staying in the Navy. Deferred scholarship entrants were associated with a lower probability of staying in the Navy. The USUHS variable was not statistically significant (.8376), probably due to small class size each year (<150). Physicians of higher rank were associated with a higher probability of staying in the Navy. Physicians having between 15 and 20 (YOS3) years of service were associated with a higher probability of staying. However, once a physician reaches 20 years of service (YOS4), there is a sharp decrease in the probability of remaining in the Navy. Minorities were also associated with a higher probability of staying in the Navy. According to previous studies referenced in Chapter II, it is possible that minority physicians expect to face less employer or patient discrimination in the Navy than in the private sector. The gender (female) variable was not statistically significant (.2921).

Table 19. Logit retention model analysis for fiscal year 1992 through fiscal year 1996 (with fixed effects) (AAMC data)

Variable	Coefficient	Std Error	Chi-square[a]	P-value[b]
Intercept	.5452	.1347	16.3752	.0001
Paydif	-.00000918	.000002379	14.8905	.0001
Female	.1626	.1543	1.1098	.2921
Single	.4357	.1313	11.0075	.0009
Direct	.1334	.1580	.7130	.3985
USUHS	-.0426	.2079	.0420	.8376
DAFHPSP	-.5529	.1171	22.3012	.0001
Other	-.2014	.1896	1.1281	.2882
CAPT	1.3007	.2396	29.4646	.0001
CDR	.8252	.1530	29.0932	.0001
Minsta	.5079	.1995	6.4806	.0109
YOS2	.1902	.1270	2.2420	.1343
YOS3	.6179	.2131	8.4030	.0037
YOS4	-.9021	.2371	14.4782	.0001
ER	-.0787	.2623	.0900	.7642
DERM	-.6150	.2762	4.9572	.0260
NEURO	-.1883	.4376	.1851	.6671
OBGYN	-.5940	.2213	7.2052	.0073
OPTH	.5074	.2976	2.9073	.0882
ENT	.5426	.2788	3.7875	.0516
PATH	-.0246	.2494	.0097	.9215
PEDS	-.6051	.1930	9.8306	.0017
PREV	-.0272	.3204	.0072	.9324
PSYCH	-.4647	.2264	4.2144	.0401
RAD	-.2638	.2145	1.5125	.2188
GENSURG	.3173	.1954	2.6364	.1044
NEUROSURG	-.4473	.5504	.6605	.4164
ORTHO	.3796	.2533	2.2459	.1340
PLASTIC	1.5195	.8293	3.3571	.0669
CARDVASC	1.7952	1.2753	1.9915	.1582
UROL	.2043	.2753	.5505	.4581
GASTRO	-.3250	.3615	.8083	.3686
CARD	-1.1368	.3749	9.1949	.0024
INTMED	-.3992	.2099	3.6161	.0572

Notes: Model chi-square = 285.91 with 33 DF; (-2 LOG L.R.) P=.0001; sample size = 3,192

a. Wald chi-square statistic

b. The probability of incorrectly rejecting the null hypotheses that the coefficient is zero. The smaller the value, the more likely that the coefficient is not zero.

Table 20 presents the model results using Hay Group physician compensation data rather than AAMC data for civilian compensation. In viewing the pay differential coefficient, the data suggests that the pay differential has a weaker affect on a physician's decision to stay than the model using AAMC data. The minority variable had a slightly higher significance level than in the AAMC model, while physicians having between 15 and 20 years of service (YOS3) had a slightly lower significance level than the AAMC model. All of the physician specialty affects on the model were consistent with the use of AAMC data, with the exception of Emergency Medicine, Neurology, Preventive Medicine, and Pathology. These differences are most likely due to these specialties having much lower pay differentials using the AAMC data.

Table 20. Logit retention model for fiscal year 1992 through fiscal year 1996 (with fixed effects) (Hay Group data)

Variable	Coefficient	Std Error	Chi-square[a]	P-value[b]
Intercept	.4403	.1637	7.2361	.0071
Paydif	-.00000481	.000002333	4.2547	.0391
Female	.0363	.1609	.0509	.8214
Single	.4621	.1401	10.8710	.0010
Direct	.1237	.1640	.5691	.4506
USUHS	-.0898	.2248	.1596	.6895
DAFHPSP	-.4853	.1253	15.0081	.0001
Other	-.2248	.1971	1.13013	.2240
CAPT	1.0065	.2346	18.4008	.0001
CDR	.5447	.1484	13.4730	.0002
Minsta	.6493	.2092	9.6286	.0019
YOS2	.1580	.1338	1.3944	.2377
YOS3	.5365	.2170	6.1139	.0134
YOS4	-.9523	.2473	14.8291	.0001
ER	.1177	.2930	.1615	.6878
DERM	-.5569	.2932	3.6068	.0575
NEURO	.1657	.4437	.1395	.7087
OBGYN	-.5062	.2682	3.5635	.0591
OPTH	.5729	.3258	3.0925	.0787
ENT	.3732	.2996	1.5511	.2130
PATH	.4354	.2714	2.5733	.1087
PEDS	-.3329	.2007	2.7517	.0972
PREV	.4543	.3222	1.9879	.1586
PSYCH	-.1719	.2396	.5143	.4733

RAD	-.1125	.2764	.1656	.6840
GENSURG	.1947	.2246	.7518	.3859
NEUROSURG	-.6986	.6036	1.3397	.2471
ORTHO	.1259	.2840	.1966	.6575
PLASTIC	1.5779	.8738	3.2609	.0709
CARDVASC	.8099	1.2307	.4331	.5105
UROL	.1843	.3056	.3640	.5463
GASTRO	-.00687	.3711	.0003	.9852
CARD	-1.0878	.3891	7.8159	.0052
INTMED	-.2026	.2240	.8182	.3657

Notes: Model chi-square = 241.56 with 33 DF; (-2 LOG L.R.) P=.0001; sample size = 3,192

a. Wald chi-square statistic.

b. The probability of incorrectly rejecting the null hypotheses that the coefficient is zero. The smaller this value, the more likely that the coefficient is not zero.

Table 21 restates the model in Table 19, but without using fixed effects for physician specialty. The table shows the weakened affect of the pay differential due to pay differential variation. The variation of the pay differential across specialties absorbs the influence of the pay gap on retention and other characteristics in the model.

Table 21. Results for logistic regression analysis for fiscal year 1992 through fiscal year 1996 (without fixed effects) (AAMC data)

Variable	Coefficient	Std Error	Chi-square[a]	P-value[b]
Intercept	.2412	.0977	6.0973	.0135
Paydif	-.00000396	.00000124	10.1910	.0014
Female	.0595	.1482	.1613	.6880
Single	.3752	.1277	8.6257	.0033
Direct	.1746	.1523	1.3137	.2517
USUHS	-.0478	.2030	.0554	.8139
DAFHPSP	-.4806	.1129	18.1309	.0001
Other	-.0860	.1846	.2168	.6415
CAPT	1.0373	.2244	21.3702	.0001
CDR	.7110	.1420	25.0592	.0001
Minsta	.4685	.1966	5.6792	.0172
YOS2	.2259	.1246	3.2870	.0698
YOS3	.6339	.2083	9.2575	.0023
YOS4	-.8307	.2304	13.0047	.0003

Notes: Model chi-square =226.632 with 13 DF; (-2 LOG L.R.) P=.0001; sample size = 3,192

a. Wald chi-square statistic

b. The probability of incorrectly rejecting the null hypotheses that the coefficient is zero. The smaller this value, the more likely that the coefficient is not zero.

Table 22 restates the model in table 20, but without fixed effects. Similar to Table 21, the variation of the pay differential across specialties absorbs the influence of the pay gap on retention and other characteristics in the model.

Table 22. Results for logistic regression analysis for fiscal year 1992 through fiscal year 1996 (without fixed effects) (Hay Group data)

Variable	Coefficient	Std Error	Chi-square[a]	P-value[b]
Intercept	.2695	.1277	4.4533	.0348
Paydif	-.00000292	.00000131	4.9620	.0259
Female	-.0213	.1538	.0192	.8897
Single	.4156	.1361	9.3306	.0023
Direct	.2090	.1581	1.7476	.1862
USUHS	-.1064	.2192	.2358	.6272
DAFHPSP	-.4293	.1202	12.7531	.0004
Other	-.1130	.1920	.3462	.5563
CAPT	.9593	.2271	17.8493	.0001
CDR	.5840	.1439	16.4709	.0001
Minsta	.6119	.2062	8.8061	.0030
YOS2	.1984	.1306	2.3061	.1289
YOS3	.5065	.2131	5.6473	.0175
YOS4	-.9313	.2415	14.8711	.0001

Notes: Model chi-square = 191.150 with 13 DF; (-2 LOG L.R.) P = .0001; sample size = 3,192

a. Wald chi-square statistic

b. The probability of incorrectly rejecting the null hypotheses that the coefficient is zero. The smaller this value, the more likely that the coefficient is not zero.

1. Marginal Effects

Marginal effects discussed in this section are calculated using the fixed effect models for the AAMC in Table 19 and the Hay Group data in Table 20. The marginal effects of the pay gap to retention discussed here are at the aggregate level. Specialty-specific marginal effects are discussed in the next section. The mean pay differential for the base case the Hay model was higher ($59,697) than in the AAMC model ($47,098). This difference in the mean pay differential affected the aggregate and specialty-specific elasticities.

In the base case of a married, LCDR, white, male, non-deferred scholarship entrant, Family Practice physician, the expected probability to stay with a pay differential

of $47,098 was .53. The probability of staying when the pay differential increased by one standard deviation (to $85,055) yields a stay probability of .44. A decrease in the pay differential of one standard deviation to $9,141 yields a stay probability of .61. The wideness of the standard deviation illustrates the variation in civilian pay. Appendix E summarizes the marginal effects for each physician characteristic.

The impact of the pay differential is less sensitive to retention in the Hay data model than the model using AAMC data. While the mean pay differential for the Hay data model is larger ($59,697) than the mean pay differential for the AAMC data model ($47,098); the coefficient of the pay differential for the Hay data model is smaller (.00000481) then the coefficient used with AAMC data (.000000918). The retention rate is .54 using the Hay data model and .53 using the AAMC data model. The larger Hay Group mean pay differential and smaller impact of the coefficient may explain a similar retention rate in the Hay data model. Using the Hay data model for the reference case of a married, LCDR, white, male, non-deferred scholarship entrant, Family Practice physician, the probability of staying when the pay differential decreased by one standard deviation to $21,304 yields a stay probability of .58. The probability of staying when the pay differential increased by one standard deviation (to $98,089) yields a stay probability of .49.

2. Elasticity of Retention

The main purpose of this logit retention model shown in Table 19 is to evaluate the influence of the pay gap on retention. The model in Table 19 indicates that the pay differential is correlated with retention. The elasticity of retention with respect to the pay differential is:

$$\text{Elasticity} = \frac{\text{Percent change in the probability of staying}}{\text{Percent change in the pay differential}}$$

The elasticity can be calculated from the following formula:

$$\text{Elasticity} = (1 - P) * \beta * \overline{Paydif}$$

where

β = Estimated coefficient of the Paydif variable.

$\overline{Paydif}$ = Mean of the Paydif variable.

P = Probability of retention for the sample.

Using AAMC data in Table 19, the elasticity is approximately .20 {(1-.53) * .00000918 * $47,098)}. A reduction in the average pay differential by 100 percent would increase the probability of staying by 20 percent. If the aggregate probability of staying were .53 for the sample, this would yield an increase in the expected retention rate to .63. For example, suppose the Navy had 1,000 unobligated specialists in a given fiscal year. Based on the model, 530 specialists would be expected to remain in the Navy. If the pay gap were closed to zero, 636 specialists would choose to stay. This would result in a retention of 106 specialists who otherwise would have been expected to leave the Navy.

As mentioned in chapter two, the aggregate pay elasticity in Dr. McMahon's study was .15. For comparison, this study recalculated the elasticity for leaving.[5] The elasticity is .23. Thus, it appears that the elasticity has increased between the 1980's and 1990's. The aggregate pay elasticity for the leaving model using the Hay Group data is .16 (.00000481 * .46 * $59,697). It appears in the Hay data model that the elasticity has increased slightly between the 1980's and 1990's. Using Hay Group data, physicians are

[5] In recalculating the elasticity for leaving, the logit model was modified by removing the descending code from the Job Control Language. This switched the signs of the parameter estimates to model for leaving as opposed to staying. Only the signs of the coefficients changed {(1-.47) * .00000918 * $47,098}=.23.

less sensitive to pay (.16) than this thesis study (.23) and slightly more sensitive to pay Dr. McMahon's study (.15). In making a comparison between the thesis and Joyce McMahon's study, physicians are more sensitive to pay in the 1990's than during the 1980's. There is little difference between elasticities using the Hay Group data and Joyce McMahon's study. However, the thesis has previous indicated that the Hay group data is less differentiated in experience level and specialty stratification than the AAMC data.

3. Specialty Group Elasticities

Pay differential elasticities were calculated for each specialty using AAMC data. This procedure was estimated by using the coefficient from the all-specialty model, the actual specialty-specific probability of staying, and the specialty-specific mean pay differential for a given year or an averaged group of years. For example, the average retention for a Pediatrician from 1992-1996 is .65 and the pay differential for this specialty for that time period is $15,422. The maintained assumption is that the estimated pay differential coefficient is the same for all specialties. The calculated elasticity using the AAMC data model coefficient with fixed effects (.00000918) is .09.

Table 23 lists the specialty specific elasticities. The results from Table 23 indicate that the elasticities are large for procedural (surgical) specialties and relatively low for Primary Care physicians. Primary care physicians are not as sensitive to pay as surgical specialties. Generally, specialties with the largest pay differentials show the greatest responsiveness. Elasticities by specialty for each year from 1992 through 1996 are provided in Appendix F.

Table 23. Elasticity of probability of staying with respect to pay differentials for 1992-1996

Specialty	Elasticity (rounded) Stay
Preventive Medicine	.02
Pathology	.04
Pediatrics	.05
Family Practice	.05
Neurology	.06
Psychiatry	.06
Gastroenterology	.07
Internal medicine	.10
Emergency Medicine	.14
Ophthalmology	.18
Anesthesiology	.20
Plastic Surgery	.22
Dermatology	.24
Radiology	.25
Urology	.26
General Surgery	.27
Cardiology	.29
Otolaryngology	.31
OB/GYN	.33
Orthopedics	.44
Neuro-surgery	.79
Cardio/thoracic	-.-a

a: Cardiovascular/thoracic surgeons experienced perfect retention from 1992-1996.

Table 24 compares specialty-specific pay elasticities from McMahon's 1989 CNA study with this study. The 1980's were a period of high managed care growth and little managed care penetration. The 1990's were a period of health care reform, where the private sector is experiencing high managed care penetration throughout the country. It is noteworthy to observe the increase in elasticities among primary care physicians.

Table 24. Comparison of the mean elasticity of probability of leaving with respect to pay differentials for 1992-1996

Specialty	Elasticity (rounded)	
	CNA Study (1984-1987)	Thesis (1992-1996)
Pediatrics	.01	.09
Family Practice	.07	.09
Internal medicine	.09	.17
Psychiatry	.09	.11
Gastroenterology	.12	.12
Neurology	.12	.10
Pathology	.12	.12
Dermatology	.14	.25
Cardiology	.17	.14
OB/GYN	.19	.23
Neuro-surgery	.72	.37
Radiology	.27	.27
Anesthesiology	.30	.32
Plastic Surgery	.39	.82
Urology	.39	.39
Orthopedics	.43	.56
Ophthalmology	.43	.38
Otolaryngology	.44	.52
General Surgery	.45	.46
Cardio/thoracic	.71	-.-a

a: Cardiovascular/thoracic surgeons experienced perfect retention from 1992-1996.

Primary care physicians have become more sensitive to pay in the health care reform environment than they were during the 1980's. With the exception of neuro-surgery, procedural specialties experienced an increase in sensitivity to pay. Hospital-based (RAPs) experienced stable results and did not change much over the period of time. Office based specialties had mixed results.

There are many factors that are important to physicians when they decide whether to stay in the Navy or seek civilian employment. The gatekeeper role is increasing the opportunity for primary care physicians to manage patients across the continuum of care,

as opposed to bypassing a primary care provider and seeking a specialist. Physicians choose to stay or leave for many reasons, some of which are not quantifiable. Increasing pay to the median civilian level would substantially increase retention. Paying physicians at the median civilian level would be extremely expensive and probably be cost-effective. An increase of $10,000 (20 percent decrease in pay differential) to an average of 700 unobligated physicians each year would cost an estimated $7 million. This amount would keep an estimated 17 physician specialists in the Navy, who otherwise would have left.

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

Health care reform and the growth of managed care in the civilian sector have altered the relative demand for specialty and primary care physicians. Legislation instituted in 1992 by the Health Care Financing Administration placed an increased emphasis on primary care by modifying fee schedules through the Resource Based Relative Value Scale (RBRVS). This primary care is the basic or general health care traditionally provided by family practice, pediatric, and general internal medicine physicians. Because managed care organizations employ more generalists and fewer specialists; the labor market for primary care physicians has become highly competitive. This change in relative demand for physician specialties has lead to a scarcity of primary care physicians, causing earnings to rise, and an increase in the ratio of the earnings of primary care to specialists.

The Department of Defense, Health Affairs has responded to this managed care shift by using the annual Hay Group physician compensation survey in to help determine medical special pays. Through the use of the annual Hay survey, the Navy has taken the changing health care environment into account when designing the pay schedules for Navy physicians. However, preliminary analysis indicates that the current physician pay structure may not fully reflect the rapidly changing health care environment.

The arrival of health care reform has necessitated an update to a 1989 study conducted by Joyce McMahon at the Center for Naval Analyses. Her study quantified the role of the pay differential and concluded that the civilian-military pay differential has a

significant influence on the probability that a physician leaves the Navy. She found that increasing pay could be an effective policy tool to increase specialist retention.

This study quantified the role of pay gap on retention using a multivariate logit retention model, and linked various characteristics of fully trained physicians to the observed probability of staying in the Navy. The physician personnel data used in this thesis was gathered from the Defense Manpower Data Center, while physician compensation data was gathered from the American Association of Medical Colleges and the Hay Group. Two logit models were estimated, one using AAMC data and the other using Hay Group data.

Civilian physicians experienced higher earnings growth than Navy physicians on average over this 5-year period, 1992 – 1996. The pay differential increased with experience level for all specialists and was larger for specialists who required extensive training. In 1988, on average, Navy physician specialists earned 79 percent of what their counterparts earned in the private sector. In 1996, Navy physician specialists earned only 66 percent of what their counterparts earned in the private sector. The Hay data revealed that Navy physicians earned only 58 percent of their civilian counterparts in 1996. However, specific specialties such as Anesthesiology, Orthopedics, Emergency Medicine, and Neurology experienced a closing of the pay gap.

Estimates from the logit retention model using AAMC and Hay Group data showed that minorities and physicians of a higher rank were associated with a higher probability of staying in the Navy. Married physicians and scholarship entrants were associated with a

lower probability of staying in the Navy. The model verified that as the pay gap increases the probability of staying decreases.

Recent shifts in demand, stemming from health care reform, have resulted in an increased sensitivity of retention to pay for physicians (using AAMC data) in the 1990s compared to the 1980s. The aggregate pay elasticity for the 1980s in the prior CNA study was .15, while in this study it was .23. Of greater importance, primary care physicians were more sensitive to pay in recent years. This would be predicted from the growth in managed care and the growth in civilian earnings opportunities for generalists. The gatekeeper role has increased the opportunity for primary care physicians to manage patients across the continuum of care. As this opportunity grew for primary care physicians in the private sector, the retention rate has dropped among primary care physicians from 80 to 65 percent.

The model using Hay Group physician compensation survey data provides a slightly different picture of the physician specialist pay elasticity. The aggregate pay elasticity for specialists was slightly more sensitive than the prior CNA study at .16, but less sensitive than when we used AAMC data in the model. The very high variation in pay differentials among specialists may have absorbed the pay gap impact on retention.

B. CONCLUSIONS

Specialty-specific elasticities can be applied to analyze the expected impact of pay on retention of representative pay plans. Results of pay proposals would increase not only costs, but also retention of physicians by increasing the expected retention probability. The model would be used to simulate how many physicians will stay who otherwise would have left. For example, if the Navy eliminated the pay differential for unobligated specialists, what would be the effect on retention? Would the cost savings from keeping a small number of Navy specialists be worth the exorbitant amount of money spent to decrease the pay gap? A closure of the pay gap to the civilian median would require an average raise of $47,000. This would cost $32.9 million in annual payments to an average of 700 unobligated specialists. A current aggregate elasticity of .23 and a 60 percent retention rate yields a saving of 97 physicians who would stay rather than leave. Under similar circumstances if the pay differential were reduced by 10 percent, the number of physicians staying (who would have left) is 10 at a cost of $3.3 million. The goal would be to specifically target specialty pay to mission critical specialty requirements to alleviate the cost burden of keeping specialists in the Navy.

After viewing such costs, the decision to "make or buy" comes into focus. The Navy needs to consider whether they want to spend money to grow physicians or attempt to purchase fully trained specialists on the market. With the overspecialized civilian physician force leading to a decrease in relative demand for specialists, the Navy may get specialists at a competitive price.

Physicians choose to stay or leave the Navy for many reasons, some of which are not quantifiable. Factors such as the opportunity to practice in their medical specialty, adequate support personnel, research opportunities, quality improvement tasks, non-physician health care, administrative tasks, and miscellaneous quality of life issues are difficult to assess.[1]

With inventory shortages in Family Practice, Internal Medicine, and Emergency Medicine, difficult decisions will be made regarding future Navy wartime demand for such specialties. Navy medicine will require dynamic leadership to balance the future demands of physician specialists with limited resources. The implementation of the Total Health Care Support Readiness Requirement will be a tremendous challenge in an environment of competing demands. THCSRR will play an ever-increasing role in merging the task of predicting wartime demands and fulfilling the peace time mission of serving the 700,000 active duty Navy and Marine Corps members and 2.6 million active duty, retired and family members.

Reductions in the active duty force may reduce the need for Navy physicians. This will also spur initiatives to reshape the medical corps to better serve the needs of a well-defined active-duty and beneficiary population. The composition of the force is also expected to shift away from the surgical specialist,[2] along with the ability to contract for specialty care from the civilian sector. This changing military environment in conjunction with the managed care environment of narrowing income differentials between specialists

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[1] Non-physician health care tasks are those normally performed by a nurse, orderly, or corpsman. Clerks, receptionists, secretaries, or administrative personnel usually perform non-physician administrative tasks.

[2] Ruhnke, 70.

and primary care physicians, may cause for the Navy to re-evaluate its pay structure and examine options for the amount, attached obligation, and recipients of medical special pays.

C. RECOMMENDATIONS

In order to deal with increasing constrained resources and changing health care market, the authors recommend using specialty-specific pay elasticities, described earlier, at the Health Affairs counsel quarterly meetings when determining physician specialty pays. Pay elasticities quantify the effects of the pay differential on retention. These elasticities will allow the Quarterly Health Affairs Specialty Council to specifically target mission-critical specialties based on the probability that a physician will leaves.

The authors further recommend that Health Affairs modify the use of the annual Hay group survey data by developing a method for representing data for physician specialties by experience level. The current use of specialty pay comparisons does not account for the differences in experience based on both seniority and rank. Health Affairs could consider the use of the AAMC data to provide conservative earnings comparison and to account for experience level.

Additionally, the users of the Hay Group data may consider accounting for the surgical specialties of Plastic Surgery, Cardiovascular/thoracic surgery, and Neurosurgery as separate categories as opposed to combining them into one surgical subspecialty category. We also recommend separating Cardiology and Gastroenterology, currently combined into one category, into two categories.

The authors recommend paying the Multi-Year specialty pay to physicians earlier in their careers, preferably at the initial obligation point. Retention at the initial obligation point has been historically low (mid-40 percent in the 1980s). Higher ranking physicians (O-5's and O-6's) have a high probability of staying with increased pay differentials. If a senior specialist with 15 to 20 years of service will most likely stay, why pay them extra money to stay? The bonus amount could be targeted instead to younger specialists on the fence to leave the Navy until they reach that 15 to 20 years of service.

One of the goals of this study was to identify the initial obligation decision point for a fully trained specialist. We feel that the first decision point is particularly important, because this is when a physician decides whether to make a long-term commitment to the Navy. For most specialists, the obligated service date (OSD) in BUMIS can be used to identify the end of initial obligation. However, physicians who undertake more than one residency (or who are augmented) pose special problems in determining this decision point. In addition to having database fields for subsequent OSD periods (OSD1, OSD2, OSD3 etc.), we recommend either adding a "yes/no" field for whether a physician is currently in his initial obligation (updating the field each year). Another option is adding a four-character field titled "initial obligation" that contains the date of the initial decision point. This would expedite the time it takes to determine whether a physician is at his first decision point, and avoid the tedious task of creating a longitudinal database to determine a member's initial obligation decision point.

The following are suggestions for further research. First, the Navy should conduct a cost benefit analysis of the "make or buy" decision in relation to whether the Navy should grow physician specialists or purchase fully trained specialist physicians "off the shelf" from the civilian health care marketplace. Second, the current House committee decision to phase out GMO physicians over the next four years should be analyzed. What will that do to the structure of the Medical corps? Finally, an analysis should be conducted quantifying the role of factors other than the pay differential on the physician decision to stay or leave the Navy.

APPENDIX A

Classification of subspecialties

Specialty	Subspecialty	BUMIS specialty codes
Emergency medicine	General Emergency Medicine	16P0
Anesthesiology	General anesthesiology	15B0
Dermatology	Dermatology, General	16N0
	Derm immunology	6ND
	Derm Surgery	6NE
	Dermatopathology	6NF
	Pediatric dermatology	6NG
	Photobiology	6NH
Family practice	General Family practice	16Q0
	FP Adolescent Medicine	62A
	FP Geriatric Medicine	62E
Neurology	General Neurology	16T0
	Child neurology	6TD
	Neurological ophthalmology	6TF
	Neuro physiology	6TG
	Critical care neurology	
Obstetrics and gynecology	General Obstetrics/Gynecology	62C
Ophthalmology	General Ophthalmology	15G0
	Comprehensive Ophthalmology	6GD
	Corneal eye disease	6GE
	Glaucoma	6GF
	Neurological-Ophthalmology	6GG
	Ocular-plastics	6GH
	Ophthalmologic pathology	6GI
	Retinal Surgery	6GJ
	Strabismology	6GK
Otolaryngology	General Otolaryngology	15I0

Classification of subspecialties

Specialty	Subspecialty	BUMIS specialty codes
Pathology	General Pathology	15M0
	Blood bank/transfusion	6MD
	Chemical pathology	6ME
	Cytopathology	6MF
	Dermatopathology	6MG
	Forensic pathology	6MH
	Hematopathology	6MI
	Immunopathology	6MJ
	Neuropathology	6MK
	Surgical pathology	6ML
Pediatrics	General Pediatrics	16V0
	Allergy/immunology	6VF
	Child abuse	6VH
	Pediatric critical care	6VI
	Developmental pediatrics	6VJ
	Pediatric endo metabolism	6VK
	Pediatrics gastroenterology	6VL
	Pediatric hematology/oncology	6VN
	Pediatric infectious disease	6VP
	Child neurology	6VU
	Pediatric nephrology	6VQ
	Pediatric pulmonary	6VR
	Pediatric rheumatology	6VS
	Pediatric toxicology	6VW
	Adolescent medicine	62A
	Pediatric faculty development	62D
	Sports medicine	62G
	Genetics	6VO
Preventive medicine	General Preventive Medicine	15K0
	General Occupation Medicine	15K2
Psychiatry	General Psychiatry	16X0
	Child psychiatry	6XH
Radiology	Diagnostic radiology	16Y0
	Imaging radiology	6YD
	Interventional/vascular	6YE

Classification of subspecialties

Specialty	Subspecialty	BUMIS specialty codes
	Neuro - radiology	6YF
	Nuclear radiology	6YG
	Pediatrics radiology	6YI
General Surgery	General Surgery	15C0
Neurological Surgery	General Neurological Surgery	15D0
Orthopedic	General Orthopedic Surgery	15H0
Plastic Surgery	Plastic Surgery	6CJ
Other Surgery Subspecialties	Cardiovascular-thoracic Surgery	6CD
	Peripheral vascular Surgery	6CI
Urology	General Urology	15J0
Gastoenterology	Gastoenterology	6RL
Cardiology	General Cardiology	6RG
Internal medicine	General Internal Medicine	16R0
	Allergy/immunology	6RF
	Cardiac electrophys	6RH
	Interventional cardiology	6RI
	Endocrinology	6RK
	Hematology/oncology	6RN/O
	Infectious diseases	6RP
	Nephrology	6RQ
	Pulmonary disease	6RR
	Rheumatology	6RS
	IM Tropical medicine	6RV
	IM Adolescent medicine	62A
	Allergy immunology	62B
	IM Critical care	62C
	Faculty development	62D
	Geriatric medicine	62E
	IM Sports medicine	62G

APPENDIX B

Pay distributions for AAMC physicians by specialty, 1996

Specialty	Assistant Professor	Associate Professor	Professor
Emergency Medicine			
Sample Size	410	101	44
Mean Income	135,600	151,300	167,600
20th percentile	118,000	132,000	127,000
50th percentile	133,000	149,000	164,000
80th percentile	155,000	173,000	183,000
Anesthesiology			
Sample Size	1366	566	284
Mean Income	156,900	191,700	209,800
20th percentile	128,000	160,000	175,000
50th percentile	150,000	184,000	204,000
80th percentile	182,000	217,000	240,000
Dermatology			
Sample Size	140	81	80
Mean Income	137,800	187,400	200,900
20th percentile	97,000	110,000	130,000
50th percentile	120,000	164,000	169,000
80th percentile	171,000	226,000	232,000
Family Practice			
Sample Size	589	291	96
Mean Income	107,300	123,200	137,600
20th percentile	91,000	103,000	118,000
50th percentile	104,000	120,000	128,000
80th percentile	123,000	140,000	152,000
Neurology			
Sample Size	429	285	278
Mean Income	101,100	124,900	159,700
20th percentile	80,000	101,000	128,000
50th percentile	94,000	121,000	148,000
80th percentile	120,000	146,000	179,000

Pay distributions for AAMC physicians by specialty, 1996

Specialty	Assistant Professor	Associate Professor	Professor
Obstetrics and Gynecology			
Sample Size	689	379	290
Mean Income	156,400	196,300	218,100
20th percentile	121,000	145,000	160,000
50th percentile	147,000	183,000	200,000
80th percentile	188,000	233,000	255,000
Ophthalmology			
Sample Size	258	163	152
Mean Income	156,900	202,200	220,700
20th percentile	112,000	144,000	152,000
50th percentile	138,000	188,000	195,000
80th percentile	184,000	245,000	264,000
Otolaryngology			
Sample Size	231	113	81
Mean Income	188,300	221,100	247,600
20th percentile	130,000	165,000	172,000
50th percentile	164,000	200,000	223,000
80th percentile	230,000	270,000	310,000
Pathology			
Sample Size	501	436	528
Mean Income	107,700	133,700	160,600
20th percentile	91,000	111,000	133,000
50th percentile	104,000	132,000	157,000
80th percentile	124,000	154,000	193,000
Pediatrics			
Sample Size	1819	1108	972
Mean Income	103,100	123,600	146,900
20th percentile	82,000	96,000	118,000
50th percentile	97,000	115,000	138,000
80th percentile	120,000	147,000	170,000

Pay distributions for AAMC physicians by specialty, 1996

Specialty	Assistant Professor	Associate Professor	Professor
Preventive Medicine			
Sample Size	13	8	12
Mean Income	101,400	119,900	150,800
20th percentile	86,000	94,000	117,000
50th percentile	97,000	104,000	139,000
80th percentile	109,000	156,000	196,000
Psychiatry			
Sample Size	771	457	404
Mean Income	101,500	122,700	149,900
20th percentile	84,000	100,000	118,000
50th percentile	99,000	120,000	143,000
80th percentile	119,000	144,000	179,000
Radiology			
Sample Size	991	538	602
Mean Income	158,400	195,700	212,300
20th percentile	130,000	161,000	176,000
50th percentile	156,000	195,000	212,000
80th percentile	184,000	225,000	245,000
General Surgery			
Sample Size	745	455	532
Mean Income	165,900	225,200	241,500
20th percentile	126,000	155,000	175,000
50th percentile	155,000	202,000	227,000
80th percentile	198,000	280,000	304,000
Neurological Surgery			
Sample Size	162	92	102
Mean Income	222,300	302,200	346,000
20th percentile	158,000	200,000	225,000
50th percentile	203,000	269,000	316,000
80th percentile	277,000	392,000	451,000

Pay distributions for AAMC physicians by specialty, 1996

Specialty	Assistant Professor	Associate Professor	Professor
Orthopedic			
Sample Size	338	176	141
Mean Income	226,900	255,900	274,800
20th percentile	150,000	188,000	190,000
50th percentile	198,000	235,000	244,000
80th percentile	275,000	334,000	346,000
Plastic Surgery			
Sample Size	109	52	63
Mean Income	196,600	259,500	287,500
20th percentile	138,000	155,000	200,000
50th percentile	168,000	226,000	263,000
80th percentile	230,000	374,000	369,000
Cardiovascular-Thoracic Surgery			
Sample Size	128	91	118
Mean Income	222,300	374,000	433,400
20th percentile	169,000	224,000	213,000
50th percentile	200,000	293,000	362,000
80th percentile	261,000	499,000	600,000
Urology			
Sample Size	118	100	124
Mean Income	150,900	220,900	242,400
20th percentile	113,000	165,000	168,000
50th percentile	147,000	211,000	213,000
80th percentile	182,000	280,000	299,000
Gastoenterology			
Sample Size	184	104	134
Mean Income	114,600	158,700	169,100
20th percentile	93,000	124,000	133,000
50th percentile	110,000	156,000	164,000
80th percentile	132,000	180,000	196,000

Pay distributions for AAMC physicians by specialty, 1996

Specialty	Assistant Professor	Associate Professor	Professor
Cardiology			
Sample Size	412	276	330
Mean Income	150,400	177,000	203,000
20th percentile	109,000	126,000	148,000
50th percentile	137,000	165,000	186,000
80th percentile	189,000	214,000	245,000
Internal Medicine			
Sample Size	2820	1844	2219
Mean Income	112,300	138,200	165,800
20th percentile	86,000	106,000	126,000
50th percentile	103,000	127,000	155,000
80th percentile	132,000	165,000	196,000

APPENDIX C

Summary data by specialty

Summary data for Emergency Medicine

Paygrade	O4	O5	O6
Inventory	66	13	9
Number of MSP takers	9	20	7
Average age	36	41	47
Average LOS	9	15	16
Percentage married	68	82	78
Mean annual income	91500	120000	133900
Minimum	60100	80600	108800
10th percentile	64400	103000	108800
25th percentile	73700	108800	132300
Median	90000	124700	134300
75th percentile	107900	131900	139600
90th percentile	119700	136100	149800
Maximum	142600	138700	149800
RMC percent of mean	51	64	78
Overall mean 104,300			
Median 107,000			

ns: Not shown due to small number of personnel in cell.

Summary data for Anesthesiology

Paygrade	O4	O5	O6
Inventory	113	43	16
Number of MSP takers	2	20	19
Average age	36	44	50
Average LOS	8	14	19
Percentage married	82	88	91
Mean annual income	101400	128600	146000
Minimum	60300	88300	102200
10th percentile	65500	119600	139600
25th percentile	79200	123400	144800
Median	107800	128900	147000
75th percentile	117000	135300	149700
90th percentile	122600	138600	153100
Maximum	210900	163900	164200
RMC percent of mean	46	59	72

Overall mean 115100
Median 119000

ns: Not shown due to small number of personnel in cell.

Summary data for Dermatology

Paygrade	O4	O5	O6
Inventory	28	14	12
Number of MSP takers	2	11	11
Average age	35	41	47
Average LOS	8	13	19
Percentage married	86	100	100
Mean annual income	89300	114000	135300
Minimum	65300	103000	120400
10th percentile	74300	103600	133000
25th percentile	80300	105700	133600
Median	89700	111500	135700
75th percentile	98100	124200	138900
90th percentile	105100	126700	141100
Maximum	111100	127200	141400
RMC percent of mean	50	62	78
Overall mean 108400			
Median 105900			

ns: Not shown due to small number of personnel in cell.

Summary data for Family Practice

Paygrade	O4	O5	O6
Inventory	78	95	56
Number of MSP takers	18	90	54
Average age	36	43	49
Average LOS	9	14	19
Percentage married	91	83	98
Mean annual income	87200	114700	125900
Minimum	62000	83300	83900
10th percentile	68500	95600	112600
25th percentile	75500	109100	119700
Median	85900	115000	125900
75th percentile	99400	120200	131100
90th percentile	106100	128000	138400
Maximum	121300	172000	168400
RMC percent of mean	49	61	75
Overall mean 108800			
Median 112600			

ns: Not shown due to small number of personnel in cell.

Summary data for Neurology

Paygrade	O4	O5	O6
Inventory	13	10	9
Number of MSP takers	6	9	8
Average age	36	44	48
Average LOS	8	11	19
Percentage married	77	90	89
Mean annual income	91000	119100	136200
Minimum	60700	106100	112300
10th percentile	65100	107000	112300
25th percentile	79700	113900	129100
Median	95100	118700	139500
75th percentile	104100	125900	141600
90th percentile	110600	130200	153200
Maximum	110800	131200	153200
RMC percent of mean	47	59	75
Overall mean 113200			
Median 113900			

ns: Not shown due to small number of personnel in cell.

Summary data for Ob/Gyn

Paygrade	O4	O5	O6
Inventory	61	24	15
Number of MSP takers	7	16	15
Average age	37	46	50
Average LOS	8	10	16
Percentage married	85	83	93
Mean annual income	101900	123700	147300
Minimum	62600	71100	106300
10th percentile	79700	111800	133600
25th percentile	94000	120800	142600
Median	102900	124900	149900
75th percentile	112800	135700	157700
90th percentile	120500	138500	162400
Maximum	133400	150000	165300
RMC percent of mean	43	56	70
Overall mean 114600			
Median 113800			

ns: Not shown due to small number of personnel in cell.

Summary data for Ophthalmology

Paygrade	O4	O5	O6
Inventory	32	29	16
Number of MSP takers	6	22	15
Average age	36	42	51
Average LOS	8	13	21
Percentage married	78	93	69
Mean annual income	99700	126900	147300
Minimum	65300	83300	133300
10th percentile	71900	108700	134300
25th percentile	79100	123200	138400
Median	105400	128100	145600
75th percentile	117100	134200	153400
90th percentile	121300	139800	160800
Maximum	135700	174300	178200
RMC percent of mean	44	55	69
Overall mean 121800			
Median 126000			

ns: Not shown due to small number of personnel in cell.

Summary data for Otolaryngology

Paygrade	O4	O5	O6
Inventory	49	18	8
Number of MSP takers	4	12	7
Average age	36	43	48
Average LOS	8	13	20
Percentage married	82	89	100
Mean annual income	91300	122500	148100
Minimum	60500	81800	139800
10th percentile	62500	88700	139800
25th percentile	70300	116600	143100
Median	92300	127300	148600
75th percentile	109600	136200	152700
90th percentile	119500	137700	156400
Maximum	125500	139100	156400
RMC percent of mean	50	62	80
Overall mean 105400			
Median 108400			

ns: Not shown due to small number of personnel in cell.

Summary data for Pathology

Paygrade	O4	O5	O6
Inventory	36	38	20
Number of MSP takers	10	34	18
Average age	38	45	50
Average LOS	8	13	19
Percentage married	92	90	80
Mean annual income	95200	118300	125700
Minimum	63600	91300	98400
10th percentile	66600	96700	110900
25th percentile	88300	112300	118300
Median	99100	118700	127700
75th percentile	105900	124600	134700
90th percentile	109900	131300	139300
Maximum	117600	162000	141400
RMC percent of mean	48	61	70
Overall mean 111700			
Median 113800			

ns: Not shown due to small number of personnel in cell.

Summary data for Pediatrics

Paygrade	O4	O5	O6
Inventory	29	16	25
Number of MSP takers	4	15	22
Average age	36	52	52
Average LOS	9	16	20
Percentage married	69	100	88
Mean annual income	88100	108900	126200
Minimum	64100	87300	106900
10th percentile	68200	95100	119200
25th percentile	82900	99800	120600
Median	89200	110900	126000
75th percentile	95300	115200	128700
90th percentile	101100	118700	133800
Maximum	109100	130300	160100
RMC percent of mean	50	65	78
Overall mean 106400			
Median 107400			

ns: Not shown due to small number of personnel in cell.

Summary data for Preventive Medicine

Paygrade	O4	O5	O6
Inventory	19	33	27
Number of MSP takers	6	26	26
Average age	38	43	48
Average LOS	9	14	18
Percentage married	79	76	82
Mean annual income	88700	111300	126600
Minimum	66200	79500	113000
10th percentile	67600	90900	116100
25th percentile	76800	103100	121300
Median	82800	114600	127200
75th percentile	104000	118300	131500
90th percentile	108100	123600	134800
Maximum	112000	133400	140300
RMC percent of mean	49	62	74
Overall mean 111600			
Median 116400			

ns: Not shown due to small number of personnel in cell.

Summary data for Psychiatry

Paygrade	O4	O5	O6
Inventory	44	32	34
Number of MSP takers	16	27	32
Average age	39	45	51
Average LOS	9	14	21
Percentage married	82	75	79
Mean annual income	88600	111900	130900
Minimum	65000	82500	105900
10th percentile	70700	99300	119600
25th percentile	78700	109600	124800
Median	87600	115000	129600
75th percentile	99800	120100	135400
90th percentile	105200	122200	138700
Maximum	108000	124300	176900
RMC percent of mean	49	62	79
Overall mean 109000			
Median 111700			

ns: Not shown due to small number of personnel in cell.

Summary data for Radiology

Paygrade	O4	O5	O6
Inventory	94	38	17
Number of MSP takers	5	26	16
Average age	36	44	47
Average LOS	8	15	18
Percentage married	86	76	88
Mean annual income	101600	129000	143900
Minimum	62600	81900	116000
10th percentile	66200	104200	116900
25th percentile	91000	126000	139200
Median	107100	132300	142600
75th percentile	113100	137200	154800
90th percentile	123000	141100	159100
Maximum	161100	143800	169400
RMC percent of mean	46	61	70
Overall mean 114700			
Median 115500			

ns: Not shown due to small number of personnel in cell.

Summary data for General Surgery

Paygrade	O4	O5	O6
Inventory	92	46	30
Number of MSP takers	8	38	27
Average age	35	47	56
Average LOS	6	13	19
Percentage married	82	91	93
Mean annual income	100600	127700	147500
Minimum	61700	94100	112400
10th percentile	71700	113000	119800
25th percentile	87700	119300	134600
Median	102200	128900	144900
75th percentile	109300	133900	155700
90th percentile	117300	138300	178000
Maximum	187300	184300	231100
RMC percent of mean	43	55	69
Overall mean 117900			
Median 116300			

ns: Not shown due to small number of personnel in cell.

Summary data for Neurological Surgery

Paygrade	O4	O5	O6
Inventory	16	3	4
Number of MSP takers	0	1	2
Average age	36	40	50
Average LOS	6	14	18
Percentage married	81	100	100
Mean annual income	99100	136600	147200
Minimum	63100	133000	138500
10th percentile	66600	133000	138500
25th percentile	70000	133000	138800
Median	111600	136600	143500
75th percentile	116600	140200	155700
90th percentile	118300	140200	163400
Maximum	123700	140200	163400
RMC percent of mean	43	56	69
Overall mean 114000			
Median 116600			

ns: Not shown due to small number of personnel in cell.

Summary data for Orthopedics

Paygrade	O4	O5	O6
Inventory	88	19	24
Number of MSP takers	5	12	21
Average age	35	42	51
Average LOS	7	13	19
Percentage married	84	100	88
Mean annual income	101500	134500	153800
Minimum	61700	97900	118900
10th percentile	64000	116000	132500
25th percentile	79500	123900	146300
Median	112800	135300	156600
75th percentile	117600	146300	165400
90th percentile	124400	152800	169400
Maximum	143200	154900	172000
RMC percent of mean	45	58	70
Overall mean 117600			
Median 117600			

ns: Not shown due to small number of personnel in cell.

Summary data for Plastic Surgery

Paygrade	O4	O5	O6
Inventory	2	6	1
Number of MSP takers	1	3	1
Average age	38	43	57
Average LOS	5	11	18
Percentage married	100	67	0
Mean annual income	ns	140300	ns
Minimum	ns	128100	ns
10th percentile	ns	128100	ns
25th percentile	ns	133900	ns
Median	ns	145400	ns
75th percentile	ns	147000	ns
90th percentile	ns	147200	ns
Maximum	ns	147200	ns
RMC percent of mean	41	44	65

Overall mean 134800
Median 139600

ns: Not shown due to small number of personnel in cell.

Summary data for Cardiovascular-thoracic Surgery

Paygrade	O4	O5	O6
Inventory	1	7	2
Number of MSP takers	0	2	1
Average age	37	44	49
Average LOS	10	12	22
Percentage married	100	86	100
Mean annual income	ns	132800	ns
Minimum	ns	116000	ns
10th percentile	ns	116000	ns
25th percentile	ns	118400	ns
Median	ns	135100	ns
75th percentile	ns	143200	ns
90th percentile	ns	143200	ns
Maximum	ns	143200	ns
RMC percent of mean	44	49	61
Overall mean 138500			
Median 139400			

ns: Not shown due to small number of personnel in cell.

Summary data for Urology

Paygrade	O4	O5	O6
Inventory	32	11	8
Number of MSP takers	3	8	8
Average age	35	39	50
Average LOS	8	13	22
Percentage married	84	91	100
Mean annual income	92000	125400	150000
Minimum	63200	74000	135700
10th percentile	65900	116500	135700
25th percentile	78200	121900	145700
Median	93500	130100	152100
75th percentile	104700	133500	155200
90th percentile	109100	137500	158300
Maximum	122200	149400	158300
RMC percent of mean	45	62	78
Overall mean 110900			
Median 107000			

ns: Not shown due to small number of personnel in cell.

Summary data for Gastroenterology

Paygrade	O4	O5	O6
Inventory	6	11	5
Number of MSP takers	1	9	4
Average age	37	42	46
Average LOS	8	15	18
Percentage married	83	91	80
Mean annual income	99200	122800	137000
Minimum	90000	101300	130500
10th percentile	90000	117500	130500
25th percentile	92700	119200	135900
Median	99200	121800	136800
75th percentile	106700	131000	139400
90th percentile	107700	133600	142100
Maximum	107700	135200	142100
RMC percent of mean	46	56	67
Overall mean 119600			
Median 121800			

ns: Not shown due to small number of personnel in cell.

Summary data for Cardiology

Paygrade	O4	O5	O6
Inventory	21	4	4
Number of MSP takers	1	2	3
Average age	35	43	50
Average LOS	8	12	19
Percentage married	100	75	100
Mean annual income	101100	119200	134500
Minimum	66400	114100	114600
10th percentile	84600	114100	114600
25th percentile	93100	115300	121500
Median	101100	119400	137700
75th percentile	109800	123000	147600
90th percentile	112300	123800	148100
Maximum	123400	123800	148100
RMC percent of mean	50	62	81
Overall mean 108200			
Median 109000			

ns: Not shown due to small number of personnel in cell.

Summary data for Internal Medicine

Paygrade	O4	O5	O6
Inventory	41	18	25
Number of MSP takers	14	16	17
Average age	37	46	50
Average LOS	7	13	18
Percentage married	68	67	84
Mean annual income	88800	116600	128800
Minimum	62600	83700	92600
10th percentile	69600	94600	117600
25th percentile	79200	107400	126600
Median	85000	121200	130000
75th percentile	101100	125300	132400
90th percentile	113000	131600	141900
Maximum	125700	134500	145700
RMC percent of mean	48	65	79
Overall mean 107100			
Median 108400			

ns: Not shown due to small number of personnel in cell.

APPENDIX D

Military Pay comparisons with AAMC and Hay Group data

Military Pay by groupings

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	85,390	94,904	97,748	96,983	106,003	24%
Pediatrics	85,393	95,605	102,514	101,986	104,839	23%
Medicine	82,826	90,210	98,002	96,555	105,846	28%
Ave Primary Care	84,536	93,573	99,421	98,508	105,563	25%
Hospital Based						
Emergency Med	75,813	84,798	92,752	93,415	97,249	28%
Radiology	93,988	97,533	101,455	101,795	108,487	15%
Anesthesiology	91,845	102,467	106,265	107,569	112,456	22%
Pathology	91,908	99,404	102,361	103,131	109,103	19%
Ave Hospital	88,388	96,051	100,708	101,477	106,824	21%
Office Based						
Dermatology	85,505	91,980	100,406	95,977	101,894	19%
Neurology	85,435	96,657	104,227	102,286	111,449	30%
Ob/Gyn	100,541	105,652	106,485	109,176	110,975	10%
Ophthalmology	97,877	102,124	105,332	107,804	115,752	18%
Otolaryngology	87,382	90,080	93,247	96,209	103,489	18%
Prev Med	94,379	100,963	102,830	102,749	110,214	17%
Psychiatry	90,540	99,187	103,701	99,285	106,650	18%
Urology	93,082	98,621	100,451	89,495	101,933	10%
Gastroenterology	88,771	104,783	110,258	111,780	119,588	35%
Cardiology	93,339	96,673	106,081	105,552	108,214	16%
Ave Office	91,685	98,672	103,302	102,031	109,016	19%
Procedure Based						
General Surg	94,510	101,960	103,126	107,814	110,381	17%
Neuro Surgery	89,628	92,288	101,400	99,660	98,022	9%
Orthopedic	92,433	104,686	106,548	101,283	111,042	20%
Plastic	107,281	124,440	121,158	133,677	121,892	14%
Cardio/Thoracic	103,131	116,991	122,529	137,140	138,498	34%
Ave Procedure	97,397	108,073	110,952	115,915	115,967	19%

AAMC Pay data by groupings

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	95,747	102,075	105,568	107,270	121,306	27%
Pediatrics	102,847	105,539	113,477	110,023	123,429	20%
Medicine	111,996	109,736	124,952	123,214	133,773	19%
Ave Primary Care	103,530	105,783	114,665	113,502	126,169	22%
Hospital Based						
Emergency Med	127,200	125,865	136,330	134,893	142,380	12%
Radiology	154,108	163,852	169,275	166,275	174,062	13%
Anesthesiology	160,093	169,689	171,802	169,459	173,259	8%
Pathology	110,314	109,128	121,109	117,276	129,466	17%
Ave Hospital	137,929	142,133	149,629	146,976	154,792	12%
Office Based						
Dermatology	140,077	168,872	147,893	145,173	164,681	18%
Neurology	107,594	113,726	118,994	115,950	125,019	16%
Ob/Gyn	152,112	177,337	172,331	170,614	175,231	15%
Ophthalmology	158,901	162,658	172,966	173,903	187,218	18%
Otolaryngology	163,040	208,528	193,221	184,783	202,497	24%
Prev Med	97,903	108,387	94,712	102,771	126,011	29%
Psychiatry	107,727	113,728	118,725	114,709	122,627	14%
Urology	165,938	184,007	183,270	160,914	180,351	9%
Gastroenterology	111,933	118,000	128,167	129,316	149,036	33%
Cardiology	130,181	139,490	148,934	150,257	161,324	24%
Ave Office	133,541	149,473	147,921	144,839	159,400	19%
Procedure Based						
General Surg	170,100	184,727	186,461	183,616	195,637	15%
Neuro Surgery	205,187	227,190	220,586	215,329	254,235	24%
Orthopedic	205,722	226,894	229,656	229,093	239,882	17%
Plastic	212,625	240,567	235,562	224,233	248,633	17%
Cardio/Thoracic	277,077	339,107	347,279	363,373	370,710	34%
Ave Procedure	214,142	243,697	243,909	243,129	261,819	22%

Pay Differential: AAMC Pay - Military Pay

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	10,357	7,171	7,820	10,287	15,302	48%
Pediatrics	17,454	9,934	10,963	8,037	18,590	7%
Medicine	29,170	19,526	26,950	26,659	27,927	-4%
Ave Primary Care	18,993	12,210	15,244	14,994	20,606	8%
Hospital Based						
Emergency Med	51,387	41,067	43,578	41,479	45,131	-12%
Radiology	60,120	66,319	67,820	64,479	65,576	9%
Anesthesiology	68,248	67,222	65,536	61,891	60,803	-11%
Pathology	18,406	9,723	18,748	14,145	20,363	11%
Ave Hospital	49,541	46,083	48,921	45,498	47,968	-3%
Office Based						
Dermatology	54,572	76,892	47,487	49,195	62,787	15%
Neurology	22,158	17,069	14,767	13,664	13,570	-39%
Ob/Gyn	51,571	71,685	65,846	61,438	64,256	25%
Ophthalmology	61,024	60,534	67,634	66,100	71,466	17%
Otolaryngology	75,658	118,448	99,974	88,574	99,008	31%
Prev Med	3,524	7,424	(8,118)	22	15,798	348%
Psychiatry	17,187	14,540	15,024	15,424	15,977	-7%
Urology	72,856	85,385	82,819	71,419	78,418	8%
Gastroenterology	23,163	13,217	17,908	17,536	29,448	27%
Cardiology	36,842	42,817	42,853	44,704	53,110	44%
Ave Office	41,856	50,801	44,619	42,808	50,384	20%
Procedure Based						
General Surg	75,590	82,768	83,335	75,802	85,256	13%
Neuro Surgery	115,559	134,903	119,186	115,669	156,213	35%
Orthopedic	113,289	122,208	123,108	127,810	128,840	14%
Plastic	105,344	116,126	114,403	90,556	126,741	20%
Cardio/Thoracic	173,946	222,115	224,750	226,233	232,212	33%
Ave Procedure	116,746	135,624	132,956	127,214	145,853	25%

Pay Ratio: Military Pay / AAMC Pay

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	0.89	0.93	0.93	0.90	0.87	-2%
Pediatrics	0.83	0.91	0.90	0.93	0.85	2%
Medicine	0.74	0.82	0.78	0.78	0.79	7%
Ave Primary Care	0.82	0.88	0.87	0.87	0.84	2%
Hospital Based						
Emergency Med	0.60	0.67	0.68	0.69	0.68	15%
Radiology	0.61	0.60	0.60	0.61	0.62	2%
Anesthesiology	0.57	0.60	0.62	0.63	0.65	13%
Pathology	0.83	0.91	0.85	0.88	0.84	1%
Ave Hospital	0.64	0.68	0.67	0.69	0.69	8%
Office Based						
Dermatology	0.61	0.54	0.68	0.66	0.62	1%
Neurology	0.79	0.85	0.88	0.88	0.89	12%
Ob/Gyn	0.66	0.60	0.62	0.64	0.63	-4%
Ophthalmology	0.62	0.63	0.61	0.62	0.62	0%
Otolaryngology	0.54	0.43	0.48	0.52	0.51	-5%
Prev Med	0.96	0.93	1.09	1.00	0.87	-9%
Psychiatry	0.84	0.87	0.87	0.87	0.87	3%
Urology	0.56	0.54	0.55	0.56	0.57	1%
Gastroenterology	0.79	0.89	0.86	0.86	0.80	1%
Cardiology	0.72	0.69	0.71	0.70	0.67	-6%
Ave Office	0.69	0.66	0.70	0.70	0.68	0%
Procedure Based						
General Surg	0.56	0.55	0.55	0.59	0.56	2%
Neuro Surgery	0.44	0.41	0.46	0.46	0.39	-12%
Orthopedic	0.45	0.46	0.46	0.44	0.46	3%
Plastic	0.50	0.52	0.51	0.60	0.49	-3%
Cardio/Thoracic	0.37	0.34	0.35	0.38	0.37	0%
Ave Procedure	0.45	0.44	0.45	0.48	0.44	-3%

Military Pay by groupings

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	85,390	94,904	97,748	96,983	106,003	24%
Pediatrics	85,393	95,605	102,514	101,986	104,839	23%
Medicine	82,826	90,210	98,002	96,555	105,846	28%
Ave Primary Care	84,536	93,573	99,421	98,508	105,563	25%
Hospital Based						
Emergency Med	75,813	84,798	92,752	93,415	97,249	28%
Radiology	93,988	97,533	101,455	101,795	108,487	15%
Anesthesiology	91,845	102,467	106,265	107,569	112,456	22%
Pathology	91,908	99,404	102,361	103,131	109,103	19%
Ave Hospital	88,388	96,051	100,708	101,477	106,824	21%
Office Based						
Dermatology	85,505	91,980	100,406	95,977	101,894	19%
Neurology	85,435	96,657	104,227	102,286	111,449	30%
Ob/Gyn	100,541	105,652	106,485	109,176	110,975	10%
Ophthalmology	97,877	102,124	105,332	107,804	115,752	18%
Otolaryngology	87,382	90,080	93,247	96,209	103,489	18%
Prev Med	94,379	100,963	102,830	102,749	110,214	17%
Psychiatry	90,540	99,187	103,701	99,285	106,650	18%
Urology	93,082	98,621	100,451	89,495	101,933	10%
Gastroenterology	88,771	104,783	110,258	111,780	119,588	35%
Cardiology	93,339	96,673	106,081	105,552	108,214	16%
Ave Office	91,685	98,672	103,302	102,031	109,016	19%
Procedure Based						
General Surg	94,510	101,960	103,126	107,814	110,381	17%
Neuro Surgery	89,628	92,288	101,400	99,660	98,022	9%
Orthopedic	92,433	104,686	106,548	101,283	111,042	20%
Plastic	107,281	124,440	121,158	133,677	121,892	14%
Cardio/Thoracic	103,131	116,991	122,529	137,140	138,498	34%
Ave Procedure	97,397	108,073	110,952	115,915	115,967	19%

Hay Group data by groupings

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	104,600	112,350	117,400	122,150	128,400	23%
Pediatrics	108,350	115,900	126,800	123,000	133,200	23%
Medicine	112,800	117,550	134,150	129,850	140,600	25%
Ave Primary Care	108,583	115,267	126,117	125,000	134,067	23%
Hospital Based						
Emergency Med	141,100	158,600	176,550	158,150	184,200	31%
Radiology	183,750	198,350	202,000	216,000	227,700	24%
Anesthesiology	176,350	206,950	205,750	201,250	222,800	26%
Pathology	153,550	164,600	166,650	165,850	180,400	17%
Ave Hospital	163,688	182,125	187,738	185,313	203,775	24%
Office Based						
Dermatology	149,900	159,550	162,300	153,450	177,800	19%
Neurology	144,450	147,050	153,400	142,050	162,400	12%
Ob/Gyn	179,250	186,800	201,300	204,600	203,000	13%
Ophthalmology	173,550	186,550	186,500	191,550	196,300	13%
Otolaryngology	177,600	188,750	200,950	202,850	210,900	19%
Prev Med	139,050	146,950	142,200	143,300	146,200	5%
Psychiatry	129,400	135,450	141,300	136,800	148,900	15%
Urology	177,300	182,250	200,050	193,550	208,100	17%
Gastroenterology	145,400	155,800	157,500	154,750	166,800	15%
Cardiology	145,400	155,800	157,500	154,750	166,800	15%
Ave Office	156,130	164,495	170,300	167,765	178,720	14%
Procedure Based						
General Surg	169,300	173,350	186,800	191,850	195,000	15%
Neuro Surgery	241,900	274,900	276,950	269,650	298,800	24%
Orthopedic	241,900	132,450	248,950	257,600	271,100	12%
Plastic	241,900	274,900	276,950	269,650	298,800	24%
Cardio/Thoracic	241,900	274,900	276,950	269,650	298,800	24%
Ave Procedure	227,380	226,100	253,320	251,680	272,500	20%

Pay Differential: Hay Group Pay - Military Pay

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	19,210	17,446	19,652	25,167	22,397	17%
Pediatrics	22,957	20,295	24,286	21,014	28,361	24%
Medicine	29,974	27,340	36,148	33,295	34,754	16%
Ave Primary Care	24,047	21,694	26,696	26,492	28,504	19%
Hospital Based						
Emergency Med	65,287	73,802	83,798	64,735	86,951	33%
Radiology	89,762	100,817	100,545	114,205	119,213	33%
Anesthesiology	84,505	104,483	99,485	93,681	110,344	31%
Pathology	61,642	65,196	64,289	62,719	71,297	16%
Ave Hospital	75,299	86,074	87,029	83,835	96,951	29%
Office Based						
Dermatology	64,395	67,570	61,894	57,473	75,906	18%
Neurology	59,015	50,393	49,173	39,764	50,951	-14%
Ob/Gyn	78,709	81,148	94,815	95,424	92,025	17%
Ophthalmology	75,673	84,426	81,168	83,746	80,548	6%
Otolaryngology	90,218	98,670	107,703	106,641	107,411	19%
Prev Med	44,671	45,987	39,370	40,551	35,986	-19%
Psychiatry	38,860	36,263	37,599	37,515	42,250	9%
Urology	84,218	83,629	99,599	104,055	106,167	26%
Gastroenterology	56,629	51,017	47,242	42,970	47,212	-17%
Cardiology	52,061	59,127	51,419	49,198	58,586	13%
Ave Office	64,445	65,823	66,998	65,734	69,704	8%
Procedure Based						
General Surg	74,790	71,390	83,674	84,036	84,619	13%
Neuro Surgery	152,272	182,612	175,550	169,990	200,778	32%
Orthopedic	149,467	27,764	142,402	156,317	160,059	7%
Plastic	134,619	150,460	155,792	135,973	176,908	31%
Cardio/Thoracic	138,769	157,909	154,421	132,510	160,302	16%
Ave Procedure	129,983	118,027	142,368	135,765	156,533	20%

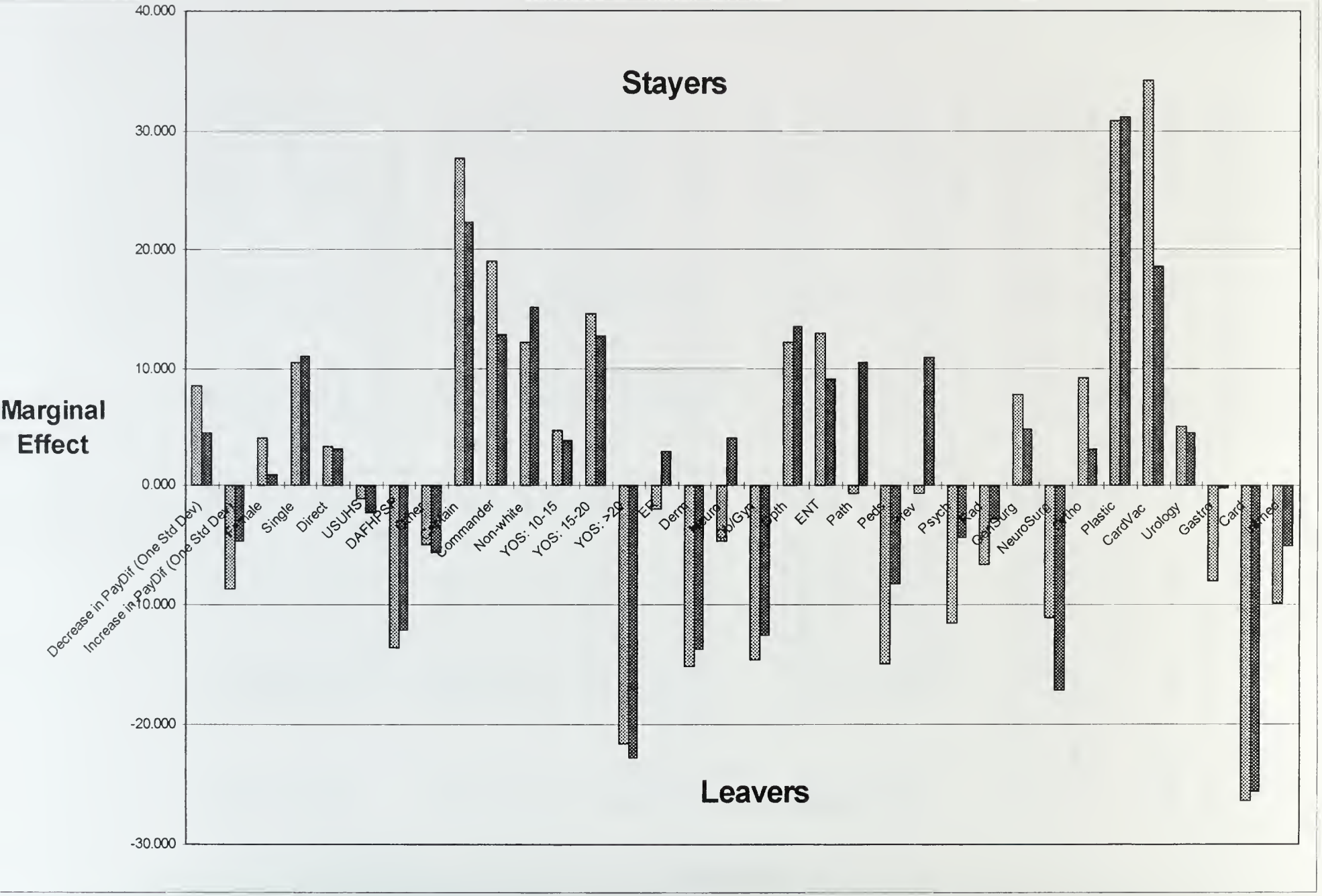
Pay Ratio: Military Pay / Hay Group Pay

Primary Care	1992	1993	1994	1995	1996	Percent Change
Family Practice	0.82	0.84	0.83	0.79	0.83	1.1%
Pediatrics	0.79	0.82	0.81	0.83	0.79	-0.1%
Medicine	0.73	0.77	0.73	0.74	0.75	2.5%
Ave Primary Care	0.78	0.81	0.79	0.79	0.79	1.1%
Hospital Based						
Emergency Med	0.54	0.53	0.53	0.59	0.53	-1.7%
Radiology	0.51	0.49	0.50	0.47	0.48	-6.9%
Anesthesiology	0.52	0.50	0.52	0.53	0.50	-3.1%
Pathology	0.60	0.60	0.61	0.62	0.60	1.0%
Ave Hospital	0.54	0.53	0.54	0.55	0.53	-2.5%
Office Based						
Dermatology	0.57	0.58	0.62	0.63	0.57	0.5%
Neurology	0.59	0.66	0.68	0.72	0.69	16.0%
Ob/Gyn	0.56	0.57	0.53	0.53	0.55	-2.5%
Ophthalmology	0.56	0.55	0.56	0.56	0.59	4.6%
Otolaryngology	0.49	0.48	0.46	0.47	0.49	-0.3%
Prev Med	0.68	0.69	0.72	0.72	0.75	11.1%
Psychiatry	0.70	0.73	0.73	0.73	0.72	2.4%
Urology	0.52	0.54	0.50	0.46	0.49	-6.7%
Gastroenterology	0.61	0.67	0.70	0.72	0.72	17.4%
Cardiology	0.64	0.62	0.67	0.68	0.65	1.1%
Ave Office	0.59	0.61	0.62	0.62	0.62	4.7%
Procedure Based						
General Surg	0.56	0.59	0.55	0.56	0.57	1.4%
Neuro Surgery	0.37	0.34	0.37	0.37	0.33	-11.5%
Orthopedic	0.38	0.79	0.43	0.39	0.41	7.2%
Plastic	0.44	0.45	0.44	0.50	0.41	-8.0%
Cardio/Thoracic	0.43	0.43	0.44	0.51	0.46	8.7%
Ave Procedure	0.44	0.52	0.45	0.47	0.44	-0.3%

APPENDIX E

Marginal Effects of Pay Differential

		AAMC Data			Hay Group Data		
			Marginal Effect	Chi-Sq		Marginal Effect	Chi-Sq
1	Base case or Reference Person	0.52819	-	-	0.53819	-	-
2	Decrease in PayDif (One Std Dev)	0.61332	8.513	0.0001	0.58366	4.547	0.0391
3	Increase in PayDif (One Std Dev)	0.44138	-8.681	0.0001	0.49208	-4.611	0.0391
4	Female	0.56843	4.024	0.2921	0.54720	0.901	0.8214
5	Single	0.63380	10.561	0.0009	0.64911	11.092	0.0010
6	Direct	0.56125	3.306	0.3985	0.56875	3.056	0.4506
7	USUHS	0.51756	-1.063	0.8376	0.51580	-2.239	0.6895
8	DAFHPSP	0.39173	-13.646	0.0001	0.41770	-12.049	0.0001
9	Other	0.47789	-5.030	0.2882	0.48207	-5.612	0.2540
10	Captain	0.80433	27.614	0.0001	0.76125	22.306	0.0001
11	Commander	0.71871	19.052	0.0001	0.66769	12.950	0.0002
12	Minsta	0.65039	12.220	0.0109	0.69048	15.229	0.0019
13	YOS: 10-15	0.57519	4.700	0.1343	0.57713	3.894	0.2377
14	YOS: 15-20	0.67496	14.677	0.0037	0.66587	12.768	0.0134
15	YOS: >20	0.31234	-21.585	0.0001	0.31019	-22.800	0.0001
16	ER	0.50855	-1.964	0.7642	0.56728	2.909	0.6878
17	Derm	0.37704	-15.115	0.0260	0.40038	-13.781	0.0575
18	Neuro	0.48116	-4.703	0.6671	0.57903	4.084	0.7087
19	Ob/Gyn	0.38197	-14.622	0.0073	0.41261	-12.558	0.0591
20	Opth	0.65029	12.210	0.0882	0.67391	13.572	0.0787
21	ENT	0.65825	13.006	0.0516	0.62860	9.041	0.2130
22	Path	0.52206	-0.613	0.9215	0.64301	10.482	0.1087
23	Peds	0.37936	-14.883	0.0017	0.45515	-8.304	0.0972
24	Prev	0.52141	-0.678	0.9324	0.64733	10.914	0.1586
25	Psych	0.41294	-11.525	0.0401	0.49530	-4.289	0.4733
26	Rad	0.46235	-6.584	0.2188	0.51014	-2.805	0.6840
27	GenSurg	0.60591	7.772	0.1044	0.58608	4.789	0.3859
28	NeuroSurg	0.41717	-11.102	0.4164	0.36689	-17.130	0.2471
29	Ortho	0.62069	9.250	0.1340	0.56929	3.110	0.6575
30	Plastic	0.83650	30.831	0.0669	0.84954	31.135	0.0709
31	CardVac	0.87080	34.261	0.1582	0.72372	18.553	0.5105
32	Urology	0.57863	5.044	0.4581	0.58356	4.537	0.5463
33	Gastro	0.44717	-8.102	0.3686	0.53648	-0.171	0.9852
34	Card	0.26426	-26.393	0.0024	0.28196	-25.623	0.0052
35	Intmed	0.42891	-9.928	0.0572	0.48762	-5.057	0.3657


Stayers
Leavers
Marginal Effect
40.000
30.000
20.000
10.000
0.000
-10.000
-20.000
-30.000
Decrease in PayDif (One Std Dev)
Increase in PayDif (One Std Dev)
Female
Single
Direct
USUHS
DAFHPSP
Other
Captain
Commander
Non-white
YOS: 10-15
YOS: 15-20
YOS: >20
ED
Derm
Neuro
Ob/Gyn
Opth
ENT
Path
Peds
Prev
Psych
Rad
GenSurg
NeuroSurg
Ortho
Plastic
CardVac
Urology
Gastro
Card
Other

AAMC Data analysis using Logistic Procedure

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	0.5452	0.1347	16.3752	0.0001	.	.
FEMALE	1	0.1626	0.1543	1.1098	0.2921	0.028585	1.177
PAYDIF	1	-9.18E-6	2.379E-6	14.8905	0.0001	-0.192092	1.000
SINGLE	1	0.4357	0.1313	11.0075	0.0009	0.087236	1.546
DIRECT	1	0.1334	0.1580	0.7130	0.3985	0.027167	1.143
USUHS	1	-0.0426	0.2079	0.0420	0.8376	-0.005468	0.958
DAFHPSP	1	-0.5529	0.1171	22.3012	0.0001	-0.128262	0.575
OTHER	1	-0.2014	0.1896	1.1281	0.2882	-0.034242	0.818
CAPT	1	1.3007	0.2396	29.4646	0.0001	0.266853	3.672
CDR	1	0.8252	0.1530	29.0932	0.0001	0.199214	2.282
NONWHITE	1	0.5079	0.1995	6.4806	0.0109	0.070295	1.662
YOS2	1	0.1902	0.1270	2.2420	0.1343	0.046598	1.209
YOS3	1	0.6179	0.2131	8.4030	0.0037	0.113971	1.855
YOS4	1	-0.9021	0.2371	14.4782	0.0001	-0.127008	0.406
ER	1	-0.0787	0.2623	0.0900	0.7642	-0.007743	0.924
DERM	1	-0.6150	0.2762	4.9572	0.0260	-0.057440	0.541
NEURO	1	-0.1883	0.4376	0.1851	0.6671	-0.011417	0.828
OBGYN	1	-0.5940	0.2213	7.2052	0.0073	-0.071851	0.552
OPTH	1	0.5074	0.2976	2.9073	0.0882	0.046396	1.661
ENT	1	0.5426	0.2788	3.7875	0.0516	0.055351	1.721
PATH	1	-0.0246	0.2494	0.0097	0.9215	-0.002924	0.976
PEDS	1	-0.6051	0.1930	9.8306	0.0017	-0.097071	0.546
PREV	1	-0.0272	0.3204	0.0072	0.9324	-0.002590	0.973
PSYCH	1	-0.4647	0.2264	4.2144	0.0401	-0.057517	0.628
RAD	1	-0.2638	0.2145	1.5125	0.2188	-0.032768	0.768
GENSURG	1	0.3173	0.1954	2.6364	0.1044	0.052413	1.373
NEUROSUR	1	-0.4473	0.5504	0.6605	0.4164	-0.023124	0.639
ORTHO	1	0.3796	0.2533	2.2459	0.1340	0.054036	1.462
PLASTIC	1	1.5195	0.8293	3.3571	0.0669	0.056977	4.570
CARDVAC	1	1.7952	1.2721	1.9915	0.1582	0.040652	6.021
UROL	1	0.2043	0.2753	0.5505	0.4581	0.019471	1.227
GASTRO	1	-0.3250	0.3615	0.8083	0.3686	-0.022809	0.723
CARD	1	-1.1368	0.3749	9.1949	0.0024	-0.077747	0.321
INTMED	1	-0.3992	0.2099	3.6161	0.0572	-0.050861	0.671

AAMC Data analysis using Logistic Procedure

OBS	PHAT	FEMALE	PAYDIF	SINGLE	DIRECT	USUHS	DAFHPSP	OTHER	CAPT	CDR	NONWHITE	YOS2	YOS3	YOS4	ER	ANEST	DERM	FAMPAC	NEURO	OBGYN	OPTH	ENT	PATH	PEDS	PREV	PSYCH	RAD	GENSURG	NEUROSUR	ORTHO	PLASTIC	CARDVAC	UROL	GASTRO	CARD	INTMED
1	0.52819	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.61332	0	9141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.44138	0	85055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.56843	1	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0.63380	0	47098	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.56125	0	47098	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0.51756	0	47098	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0.39173	0	47098	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0.47789	0	47098	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0.80433	0	47098	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0.71871	0	47098	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.65039	0	47098	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0.57519	0	47098	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0.67496	0	47098	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0.31234	0	47098	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0.50855	0	47098	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0.52819	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0.37704	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0.48116	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0.38197	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.65029	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.65825	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0.52206	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0.37936	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0.52141	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
26	0.41294	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
27	0.46235	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
28	0.60591	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
29	0.41717	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
30	0.62069	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
31	0.83650	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
32	0.87080	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
33	0.57863	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
34	0.44717	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
35	0.26426	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
36	0.42891	0	47098	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Hay Group Data analysis using Logistic Procedure

Analysis of Maximum Likelihood Estimates

Variable	DF	Parameter Estimate	Standard Error	Wald Chi-Square	Pr > Chi-Square	Standardized Estimate	Odds Ratio
INTERCPT	1	0.4403	0.1637	7.2361	0.0071	.	.
FEMALE	1	0.0363	0.1609	0.0509	0.8214	0.006493	1.037
PAYDIFH	1	-4.81E-6	2.333E-6	4.2547	0.0391	-0.100947	1.000
SINGLE	1	0.4621	0.1401	10.8710	0.0010	0.092463	1.587
DIRECT	1	0.1237	0.1640	0.5691	0.4506	0.025520	1.132
USUHS	1	-0.0898	0.2248	0.1596	0.6895	-0.011108	0.914
DAFHPSP	1	-0.4853	0.1253	15.0081	0.0001	-0.111179	0.616
OTHER	1	-0.2248	0.1971	1.3013	0.2540	-0.038999	0.799
CAPT	1	1.0065	0.2346	18.4008	0.0001	0.209905	2.736
CDR	1	0.5447	0.1484	13.4730	0.0002	0.131347	1.724
NONWHITE	1	0.6493	0.2092	9.6286	0.0019	0.092494	1.914
YOS2	1	0.1580	0.1338	1.3944	0.2377	0.038553	1.171
YOS3	1	0.5365	0.2170	6.1139	0.0134	0.099096	1.710
YOS4	1	-0.9523	0.2473	14.8291	0.0001	-0.133167	0.386
ER	1	0.1177	0.2930	0.1615	0.6878	0.012199	1.125
DERM	1	-0.5569	0.2932	3.6068	0.0575	-0.054778	0.573
NEURO	1	0.1657	0.4437	0.1395	0.7087	0.010597	1.180
OBGYN	1	-0.5062	0.2682	3.5635	0.0591	-0.064395	0.603
OPTH	1	0.5729	0.3258	3.0925	0.0787	0.055168	1.773
ENT	1	0.3732	0.2996	1.5511	0.2130	0.040071	1.452
PATH	1	0.4354	0.2714	2.5733	0.1087	0.054512	1.546
PEDS	1	-0.3329	0.2007	2.7517	0.0972	-0.056008	0.717
PREV	1	0.4543	0.3222	1.9879	0.1586	0.045596	1.575
PSYCH	1	-0.1719	0.2396	0.5143	0.4733	-0.022367	0.842
RAD	1	-0.1125	0.2764	0.1656	0.6840	-0.014696	0.894
GENSURG	1	0.1947	0.2246	0.7518	0.3859	0.033723	1.215
NEUROSUR	1	-0.6986	0.6036	1.3397	0.2471	-0.038083	0.497
ORTHO	1	0.1259	0.2840	0.1966	0.6575	0.018826	1.134
PLASTIC	1	1.5779	0.8738	3.2609	0.0709	0.062400	4.845
CARDVAC	1	0.8099	1.2307	0.4331	0.5105	0.019346	2.248
UROL	1	0.1843	0.3056	0.3640	0.5463	0.018503	1.202
GASTRO	1	-0.00687	0.3711	0.0003	0.9852	-0.000508	0.993
CARD	1	-1.0878	0.3891	7.8159	0.0052	-0.078412	0.337
INTMED	1	-0.2026	0.2240	0.8182	0.3657	-0.027696	0.817

Hay Group Data analysis using Logistic Procedure

OBS	PHAT	FEMALE	PAYDIFH	SINGLE	DIRECT	USUHS	DAFHPSP	OTHER	CAPT	CDR	NONWHITE	YOS2	YOS3	YOS4	ER	ANEST	DERM	FAMPRAC	NEURO	OBGYN	OPTH	ENT	PATH	PEDS	PREV	PSYCH	RAD	GENSURG	NEUROSUR	ORTHO	PLASTIC	CARDVAC	UROL	GASTRO	CARD	INTMED
1	0.53819	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0.58366	0	21304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0.49208	0	98089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0.54720	1	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0.64911	0	59697	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0.56875	0	59697	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0.51580	0	59697	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0.41770	0	59697	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0.48207	0	59697	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0.76125	0	59697	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0.66769	0	59697	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0.69048	0	59697	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0.57713	0	59697	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0.66587	0	59697	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0.31019	0	59697	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0.56728	0	59697	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0.53819	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0.40038	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0.57903	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0.41261	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0.67391	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0.62860	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0.64301	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0.45515	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
25	0.64733	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
26	0.49530	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
27	0.51014	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
28	0.58608	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
29	0.36689	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
30	0.56929	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
31	0.84954	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
32	0.72372	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
33	0.58356	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
34	0.53648	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
35	0.28196	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
36	0.48762	0	59697	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

APPENDIX F

Elasticities by Specialty for Stayers

	1992	1993	1994	1995	1996	Overall 1992-1996
Emergency Medicine	0.19	0.16	0.17	0.10	0.13	0.14
Anesthesiology	0.26	0.20	0.31	0.19	0.18	0.20
Dermatology	0.14	0.27	0.24	0.29	0.23	0.24
Family Practice	0.04	0.06	0.06	0.04	0.05	0.05
Neurology	0.05	0.04	0.04	0.07	0.05	0.06
Ob/Gyn	0.13	0.50	0.36	0.31	0.29	0.33
Ophthalmology	0.21	0.20	0.15	0.22	0.14	0.18
Otolaryngology	0.24	0.50	0.58	0.33	0.08	0.31
Pathology	0.08	0.01	0.07	0.05	0.04	0.04
Pediatrics	0.05	0.03	0.04	0.07	0.06	0.05
Prev Med	0.02	0.04	-0.02	0.00	0.09	0.02
Psychiatry	0.06	0.06	0.05	0.09	0.05	0.06
Radiology	0.19	0.26	0.26	0.28	0.29	0.25
General Surg	0.19	0.29	0.40	0.33	0.26	0.27
Neurological Surgery	0.71	0.73	0.56	0.80	0.99	0.79
Orthopedic	0.36	0.50	0.67	0.61	0.33	0.44
Plastic	0.00	0.00	0.53	0.34	0.00	0.22
Cardio/Thoracic	0.00	0.00	0.00	0.00	0.00	0.00
Urology	0.19	0.31	0.44	0.08	0.39	0.26
Gastroenterology	0.07	0.06	0.07	0.05	0.10	0.07
Cardiology	0.19	0.32	0.38	0.38	0.25	0.29
Medicine	0.13	0.06	0.16	0.13	0.10	0.10

Elasticities by Specialty for Leavers

	1992	1993	1994	1995	1996	Overall 1992-1996
Emergency Medicine	0.24	0.16	0.19	0.22	0.24	0.21
Anesthesiology	0.29	0.37	0.25	0.30	0.30	0.32
Dermatology	0.32	0.46	0.14	0.16	0.34	0.25
Family Practice	0.08	0.07	0.09	0.07	0.09	0.08
Neurology	0.19	0.11	0.06	0.07	0.11	0.10
Ob/Gyn	0.10	0.15	0.25	0.22	0.23	0.23
Ophthalmology	0.31	0.33	0.45	0.37	0.47	0.38
Otolaryngology	0.49	0.46	0.34	0.36	0.75	0.52
Pathology	0.14	0.07	0.11	0.11	0.14	0.12
Pediatrics	0.13	0.09	0.10	0.03	0.11	0.09
Prev Med	0.05	0.06	-0.05	0.00	0.11	0.04
Psychiatry	0.13	0.09	0.13	0.11	0.11	0.11
Radiology	0.24	0.25	0.32	0.25	0.21	0.27
General Surg	0.52	0.52	0.34	0.31	0.46	0.46
Neurological Surgery	0.54	0.18	0.56	0.27	0.42	0.37
Orthopedic	0.59	0.44	0.36	0.43	0.71	0.56
Plastic	0.00	0.00	0.53	0.51	0.00	0.82
Cardio/Thoracic	0.00	0.00	0.00	0.00	0.00	0.00
Urology	0.35	0.38	0.35	0.60	0.16	0.39
Gastroenterology	0.18	0.05	0.06	0.13	0.20	0.12
Cardiology	0.19	0.07	0.08	0.13	0.25	0.14
Medicine	0.15	0.17	0.11	0.13	0.21	0.17

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